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ABSTRACT

Intended for instructors serving the occupational needs of disadvantaged and handicapped students, this curriculum guide contains 21 units for an auto service program. Its purposes are to provide minimum skills for students entering the mainstream, supplement vocational skills of students already mainstreamed, and provide vocational instructional materials for the modified classroom. Teachers should adapt these self-paced and self-contained instructional materials to suit teaching/learning situations. The 21 units cover these areas/topics: major automobile parts; safety rules; changing oil and oil filter; lubricating auto chassis and body; checking automatic transmission fluid; checking and replacing fan belt; checking, recharging, and cleaning a battery; jumpstarting; installing antifreeze; replacing headlight, radiator hose, thermostat and fuses; cleaning and waxing a car; tire identification; changing and rotating tires; repairing tubeless tires--plugging and patching methods; balancing tires; and repacking front wheel bearings. Each unit contains these sections: (1) unit objectives and self-assessment statements; (2) introduction (motivational statement); (3) description of tools, materials, and equipment; (4) steps of procedure (explanation and illustration of given skill); and (5) student evaluation (true-false, identification, steps of procedure). (YLB)

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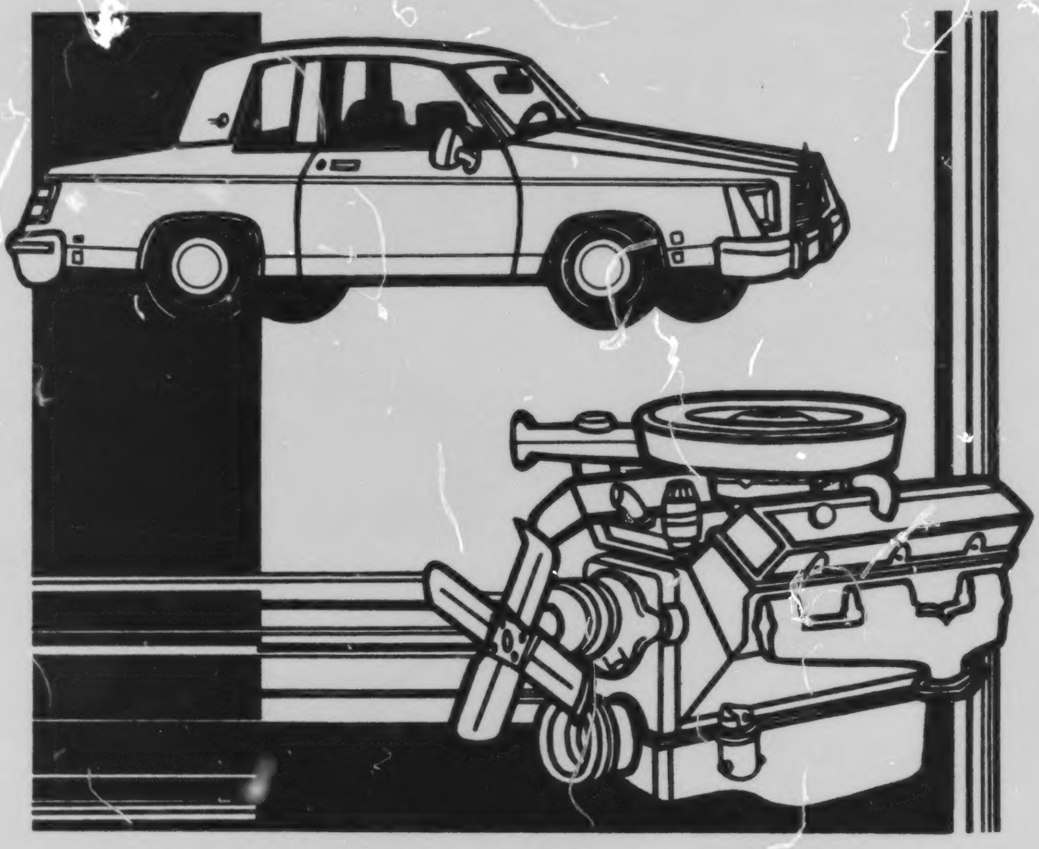
Vocational Preparation Curriculum



Auto Service

Developed By: Hogan Usoro

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Vocational Preparation Curriculum
AUTO SERVICE

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Catalog Number SN-8-S

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Vocational Preparation Curriculum
AUTO SERVICE

Preface

This Vocational Preparation Curriculum guide is a Special Needs project sponsored by the Missouri Department of Elementary and Secondary Education. The purpose of this curriculum guide is:

1. to provide minimum skills for disadvantaged and handicapped students entering the mainstream,
2. to supplement vocational skills of those students already in a regular training program (mainstream),
3. to provide vocational instructional materials for the modified classroom.

This guide is intended to be a workable guide for instructors serving the occupational needs of various categories of Special Needs students.

Twenty-one units of self-paced and self-contained instructional materials are contained within this auto service curriculum. Units are illustrated and simplified to more easily aid the student in the class activities or on an individual basis.

Each unit is color coded to represent a separate section within the unit, the color coding is:

White: Objective and Student Assessment - Presents the unit objectives. The student must meet these objectives to successfully complete the unit. Self-assessment statements help the students to determine their ability to perform the unit objectives.

Goldenrod: Introduction - Contains a brief motivational statement describing the theme of the unit.

Salmon: Tools, Materials, and Equipment - Introduces new tools, materials, and equipment necessary to complete the exercise.

Canary: Steps of Procedure - Presents a step by step explanation and illustration of the skill to be learned.

Pink: Student Evaluation - Used by the instructor to evaluate student performance. Three different forms of evaluation are presented; true-false, identification, and Steps of Procedure Evaluation.

Material within this curriculum is developed to provide a source and guideline for the instructor. The responsibility of the instructor will be to adapt material as is necessary to suit a given teaching/learning situation. It is intended that this material will provide a basis for that adaptation.

Vocational Preparation Curriculum
AUTO SERVICE

Acknowledgments

The Vocational Preparation Curriculum guide is the outcome of the expenditure in time, effort and talents of the following individuals.

Committee Members:
Ed Flanigan, Instructor, Waynesville Area Vocational-Technical School
Steve Parker, Instructor, Rolla Area Vocational-Technical School
Jim Walker, Instructor, Cass County Area Vocational-Technical School, Harrisonville, MO
Robert Wagner, Instructor, Graff Area Vocational-Technical School, Springfield, MO

Mr. Miles Beachboard, Director of Vocational Special Needs Programs, Department of Elementary and Secondary Education, Jefferson City, Missouri
Mr. Larry Lutz: Director, Camdenton Area Vocational-Technical School

Instructional Materials Laboratory, University of Missouri-Columbia

A special appreciation is accorded Dan Stapleton, graphic designer for the illustration, design, layout and production of this guide

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Dr. Harley Schlichting: Director of Instructional Materials Laboratory, for his special assistance in the preparation and completion of this Vocational Preparation Curriculum

Appreciation is also expressed to Dr. F.M. Miller of the Practical Arts and Vocational-Technical Education department and Dr. C.T. Cameron, Special Education department, University of Missouri-Columbia, for their contributions toward the development of the format in this curriculum.

A special thanks goes to all the other individuals who made contributions toward the completion of this project.

Special appreciation is expressed to Ed Flanigan for his additional support and assistance in developing this unit on Auto Service.

Notes to the Instructor

Step 1 Read through the information in this unit before presenting it to the student.

Step 2 Make sure all tools and materials to be used in this unit are available.

Step 3 Prepare any handouts, if applicable, to aid student learning activities.

Step 4 Provide the student with self-assessment (objective) sheet.

Step 5 Discuss tasks on self-assessment sheet and give directions for completing the Show What You Can Do section.

Step 6 Have student complete self-assessment sheet.

Step 7 If the student elects to take the Practical Exercise and completes it to the satisfaction of the instructor, have the student proceed to the next package. If the student fails to complete the Practical Exercise to your satisfaction or does not wish to take the exercise, proceed to Step 8.

Step 8 Provide and discuss the Introduction sheet with the student. At this time you can also discuss the Tool, Materials and Equipment list.

Step 9 Provide the student with Steps of Procedure.

Step 10 Present the Steps of Procedure. Depending on the capabilities of the student, select one or more of the following means of presentation:

a. have student study information independently,

or

b. go through the Steps of Procedure with the student individually or as a group.

Step 11 Instructor can demonstrate the procedures to the student or the group.

Step 12 Allow the student time to practice the procedure.

Step 13 When the student feels ready, use the Practical Exercise Checklist to evaluate the student's performance capabilities.

Additional Suggestions for the Instructor

Try team approach when possible.

Beginning students can work together after instructor's demonstration.

One student experienced with the procedures can work with a beginner.

For non-readers, audiotapes or videotapes of the lesson could be prepared.

Review tools and materials with the students whenever necessary. Tools and Materials Identification Exercises are provided in some units for instructors' use.

Tools and Materials Identification Exercises can be used in the following suggested way:

As a pencil and paper exercise

Actual Tool/Material Identification: Instructor holds up or points to an actual tool or material for the student to identify, or the instructor names a particular tool or material and asks the student to locate it.

Name-Object Association: Instructor prepares cards with names of tools and materials. The student matches the name card with correct object.

Additional modifications of above suggestions can be effected by the instructor to take care of other special needs conditions.

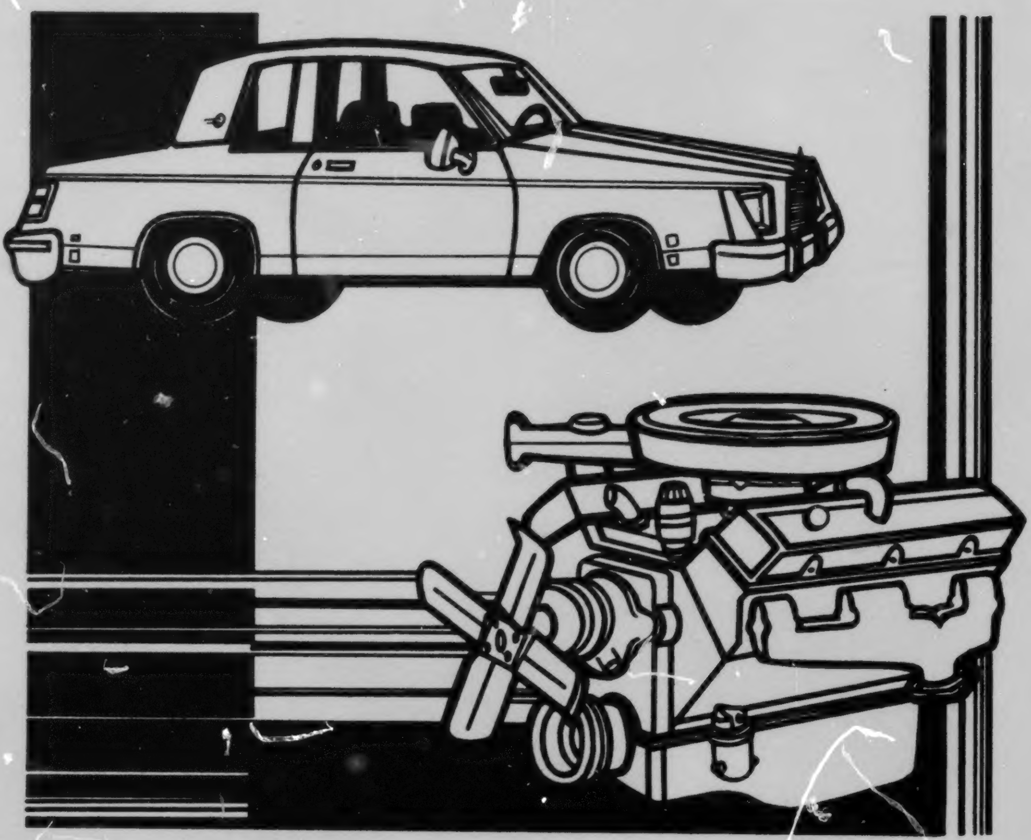
Plan visits to local auto service shops.

Vocational Preparation Curriculum
AUTO SERVICE

Class Progress Chart

											Student's Name WHAT THE STUDENT CAN DO
											Identify Major Parts of an Automobile
											Observe Auto Service Safety Rules
											Change the Oil and Oil Filter
											Lubricate the Auto Chassis and Body
											Check the Automatic Transmission Fluid
											Check, Recharge and Clean a Battery
											Jump Start a Car
											Install Antifreeze in a Car
											Replace an Automotive Headlight
											Replace a Radiator Hose and Thermostat
											Replace Fuses in an Automobile
											Clean, Wash and Wax a Car
											Identify Tires
											Change a Tire
											Rotate Tires
											Repair a Tubeless Tire - Plugging Method
											Repair a Tubeless Tire - Patching Method
											Balance Tires
											Repack Front Wheel Bearings
											Instructor's Signature Date

Vocational Preparation Curriculum
AUTO SERVICE



Unit 1

Jobs Related To Auto Service

Developed by: Hogan Usoro

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Unit 1
Jobs Related to Auto Service

Jobs Related to Auto Service

After you study this lesson, you should be able to:

1. Name and locate a company in your city which employs auto service workers.
2. Identify jobs related to auto service.
3. Name certain auto service work you would like to do and give reasons why.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

TURN THE PAGE AND BEGIN

Unit 1
Jobs Related to Auto Service

Introduction

When you look around, you see an increasing number of motor vehicles in our society. This means that qualified auto service workers will be in demand.

Trained auto service workers can work in a variety of businesses and locations. Privately owned auto shops, service stations, and department stores hire trained auto service workers. Large fleet owners such as trucking firms, utility companies and service companies service their own vehicles. Federal, state and city governments also service their vehicles. These organizations provide many jobs for trained auto service workers.

In this unit, you will learn about jobs that relate to auto service.

TURN TO NEXT PAGE

Unit 1
Jobs Related to Auto Service

A. Auto Service in Your Community

Auto service companies sell cars, maintain and repair cars, and replace parts. As an auto service worker, your job is to check the battery, brake system, antifreeze, oil, tire pressure, lights, and windshield wipers to make sure they work. Think of auto service companies or shops in your city and of services they sell. Answer these questions:

1. Name an auto repair shop or auto company in your city. Tell what it does. Where is it located?

___

___

___

2. What other auto companies and shops do you know of? Talk about auto companies and shops with your instructor.

___

___

___

3. Name an auto company or repair shop where you would like to work.

___

___

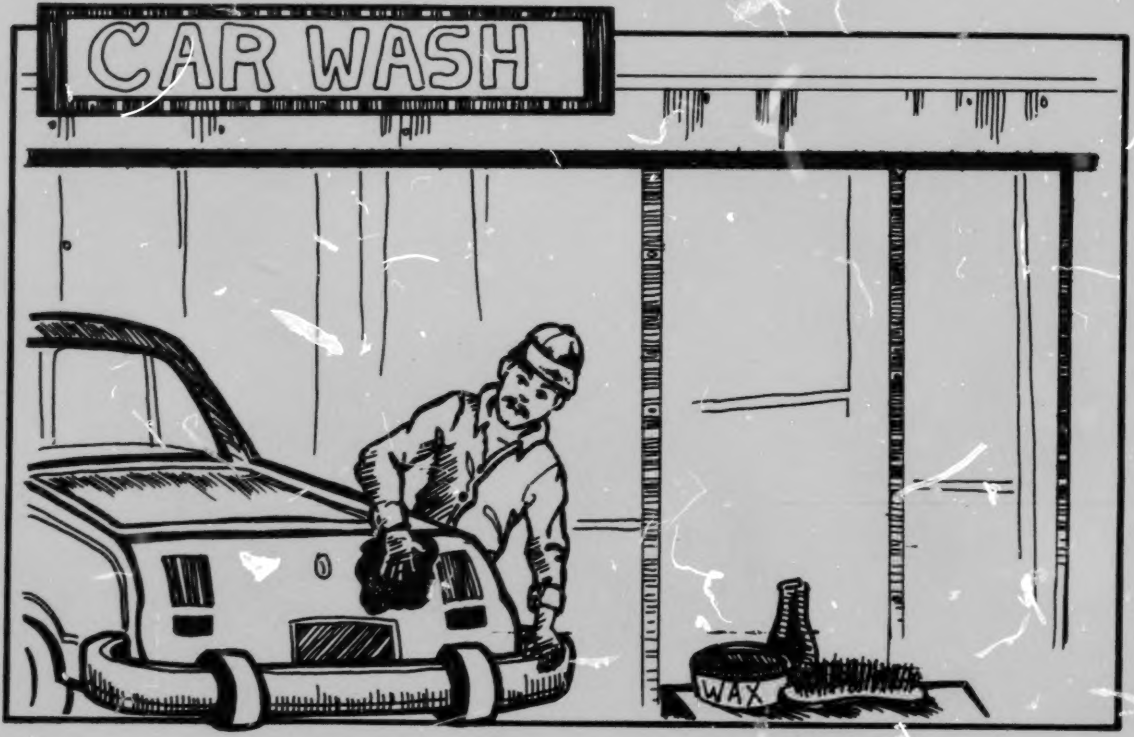
___

TURN TO NEXT PAGE

Unit 1
Jobs Related to Auto Service

B. Jobs Related to Auto Service.

1. **CAR CLEANING:** When cleaning a car you wash and wax it and vacuum the inside. You are also responsible for cleaning and maintaining the car washing station.



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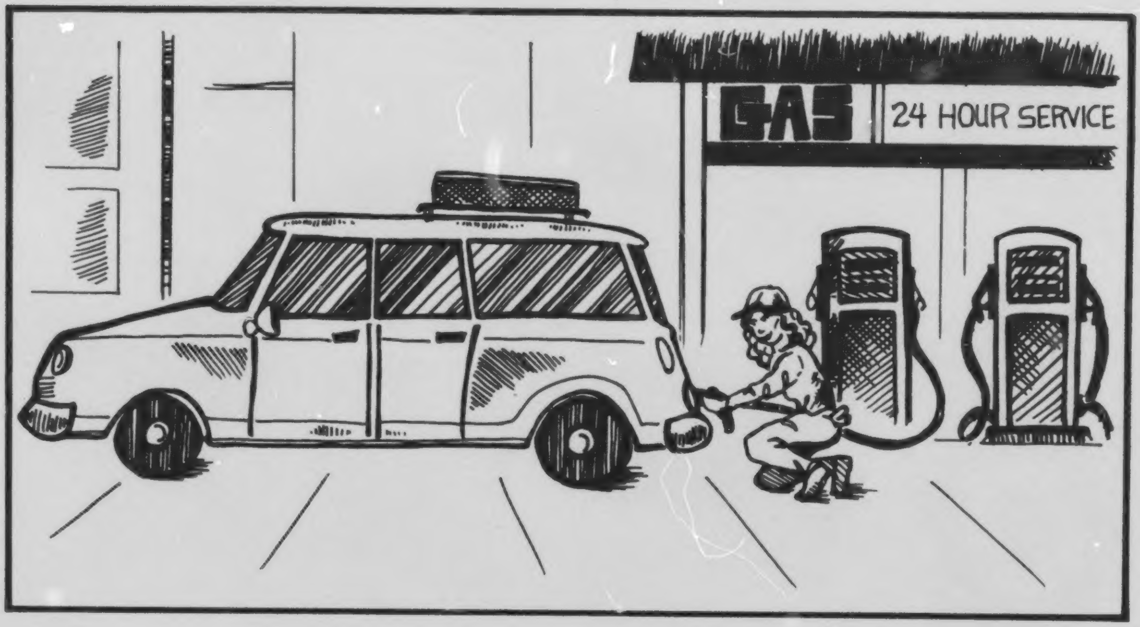
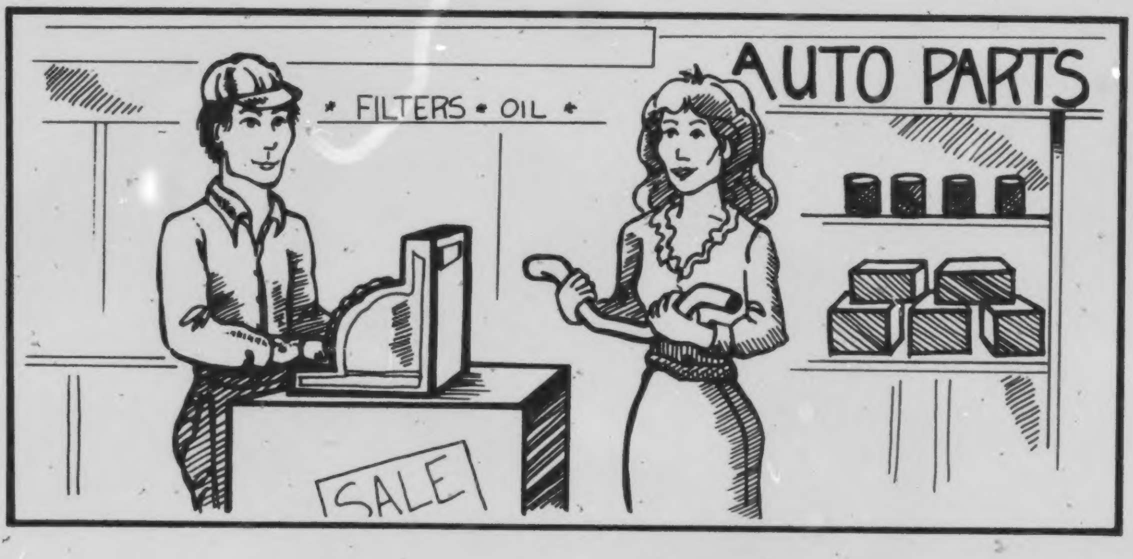
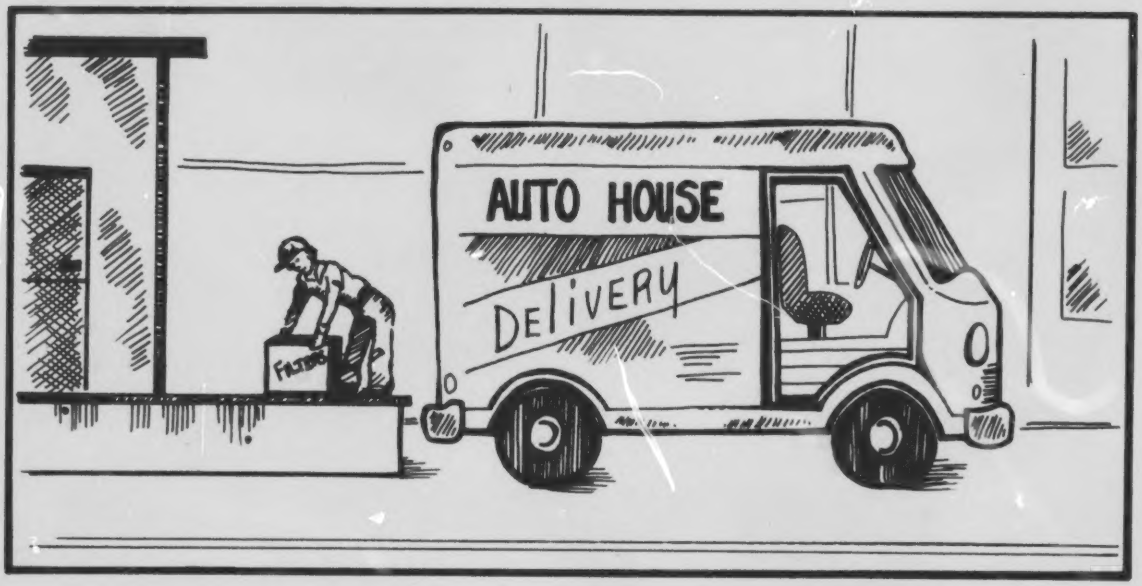
2. **SERVICE STATION ATTENDANT:** An attendant fills the gas tank, checks oil, cleans windshields and checks tire pressure for the customer.


GAS
24 HOUR SERVICE

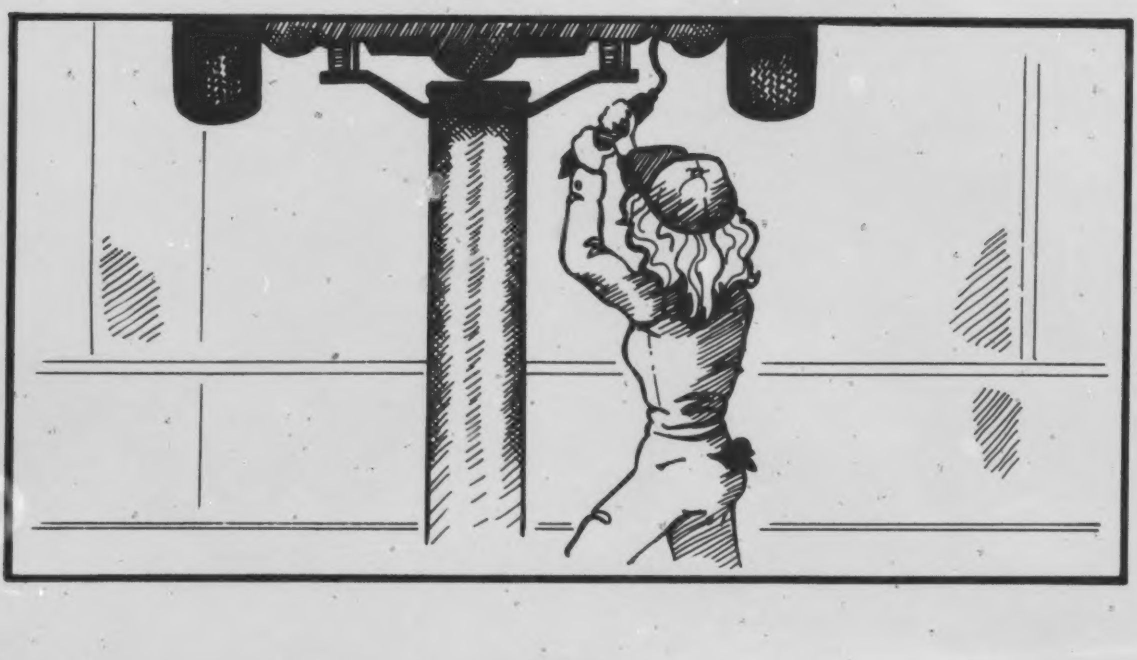
3. **AUTO PARTS CLERK:** Keeps records of auto parts and sells the parts to individuals and companies.


AUTO PARTS
* FILTERS * OIL *
SALE

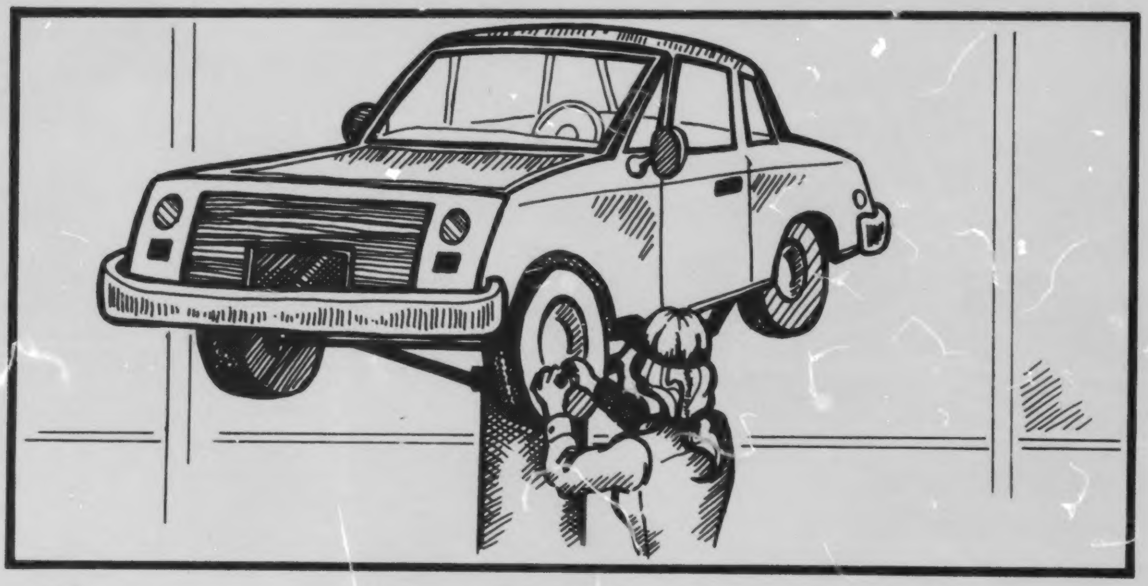
4. **DELIVERY DRIVER:** Delivers auto parts and equipment from one place to another.


AUTO HOUSE
DELIVERY
FILTERS

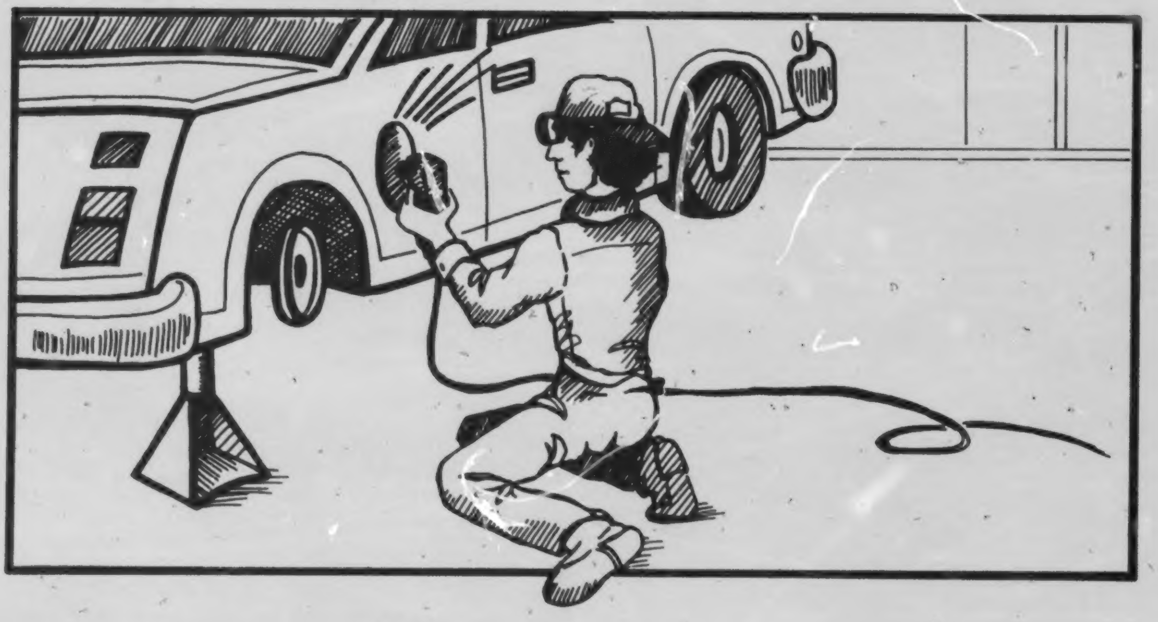
5. **LUBRICATION SPECIALIST:** Applies grease to the working parts of a car, checks oil level and changes oil.



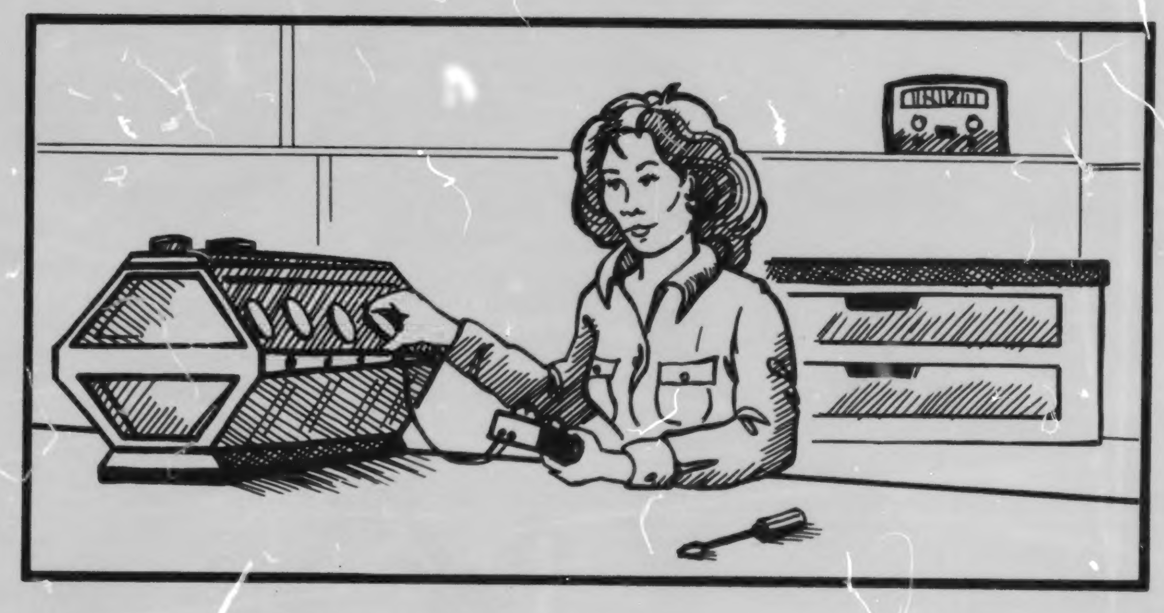
6. **FRONT END SPECIALIST:** Recognizes front end problems in cars and repairs, aligns, and balances the tires and front end.



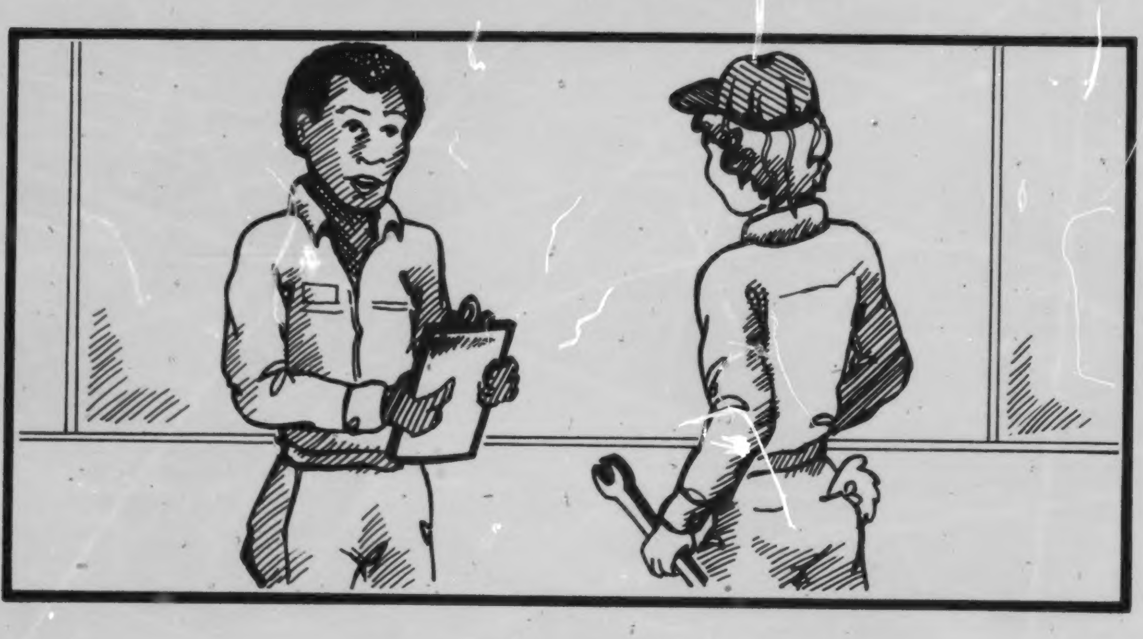
7. **BODY AND FENDER SPECIALIST:** Estimates body repair costs, and repairs metal and fiberglass body parts, paints and buffs the repaired section.



8. **AUTOMOTIVE MECHANIC:** Does major engine repair work on vehicles. The mechanic has training in engine overhauling and transmission repair.



9. **AUTOMOTIVE SHOP SUPERVISOR:** Sees that the mechanics and auto service workers complete their jobs correctly and on time. Also schedules auto service tasks, and answers customers' questions.



You have learned about auto service companies and auto repair shops, jobs related to auto service and job classifications of workers. Answer the following questions:

1. Which auto service job would you like to have?

2. Why would you choose that job? Discuss reasons with the instructor.

SEE YOUR INSTRUCTOR

Unit 1
Jobs Related to Auto Service

Practical Exercise Performance Checklist

Student's Name: ____________________

True-False Questions:
Circle "T" if the statement is True and "F" if it is False.

T F 1. In cleaning a car, you must wash and wax the body as well as vacuum the inside.

T F 2. A service station attendant is an auto service worker who specializes in automotive engine repair.

T F 3. An auto parts clerk keeps records of auto parts sales.

T F 4. An auto parts clerk can sell auto parts to individuals only.

T F 5. There are positions for delivery drivers in auto service occupations.

T F 6. One of the tasks of a lubrication specialist is to apply grease to the working parts of a car or truck.

T F 7. The tasks of a front end specialist include discovering front end problems, aligning and balancing tires.

T F 8. The body and fender specialist repairs and estimates the cost of auto body work and also repairs and paints body parts.

T F 9. An automotive shop supervisor supervises the work of mechanics and other auto service workers as well as answering their questions.

T F 10. The automotive mechanic can do nothing but change flat tires on vehicles.

Satisfactory Performance ☐
Repeat Exercise ☐
Should Move On ☐

Instructor's Signature ____________ Date ________

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Vocational Preparation Curriculum
AUTO SERVICE

Unit 2

Major Parts of an Automobile

Developed by: Hogan Usoro

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Unit 2
Major Parts of an Automobile

Major Parts of an Automobile

After you study this lesson, you should be able to:

1. Identify major parts of an automobile.
2. Identify a given part of an automobile with its function or use.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

TURN THE PAGE AND BEGIN

Unit 2
Major Parts of an Automobile

Introduction

To successfully repair an automobile, you must study its parts and their functions. This knowledge of car parts and their functions will help to solve automotive problems.

In this lesson you will learn the major parts of an automobile and their functions.

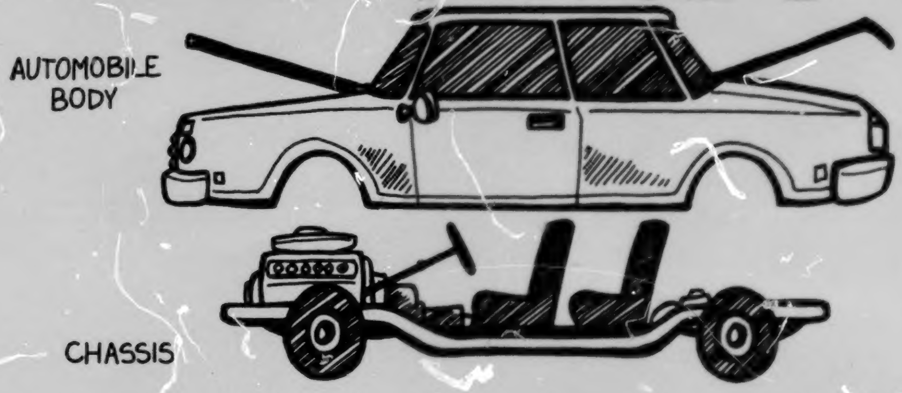
AUTO REPAIR SHOP

TURN TO NEXT PAGE

Unit 2
Major Parts of an Automobile

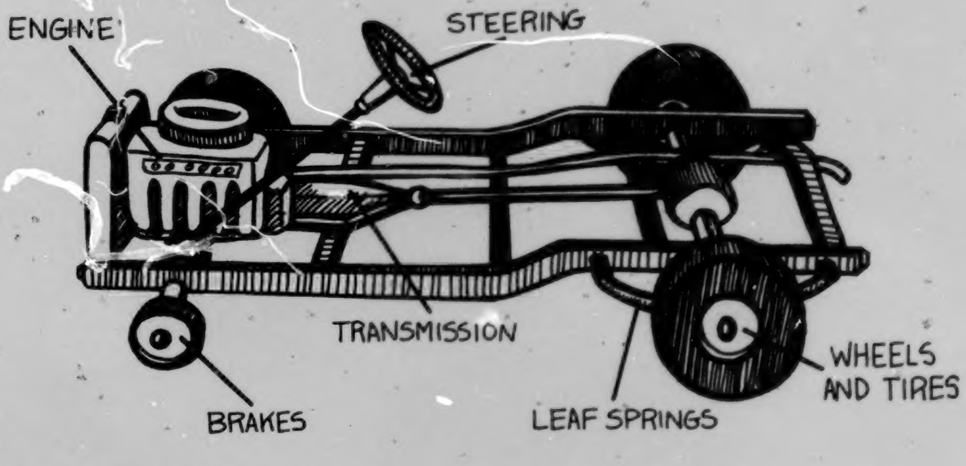
An automobile has two major parts, the chassis and the auto body.

The auto chassis is a metal frame that supports the body, engine and the tires. The auto body encloses the engine and people in the car. You must learn these parts in order to do well in auto service.


AUTOMOBILE BODY
CHASSIS

A. The Automobile Chassis.

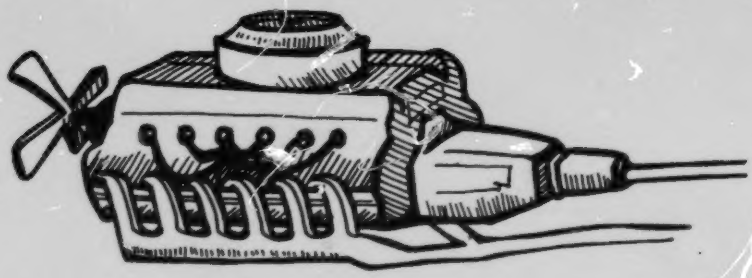
The picture below shows the chassis and its major parts. Study carefully where each part is located. Parts of the chassis have different functions but they work together to make a car run.


ENGINE
STEERING
TRANSMISSION
WHEELS AND TIRES
BRAKES
LEAF SPRINGS

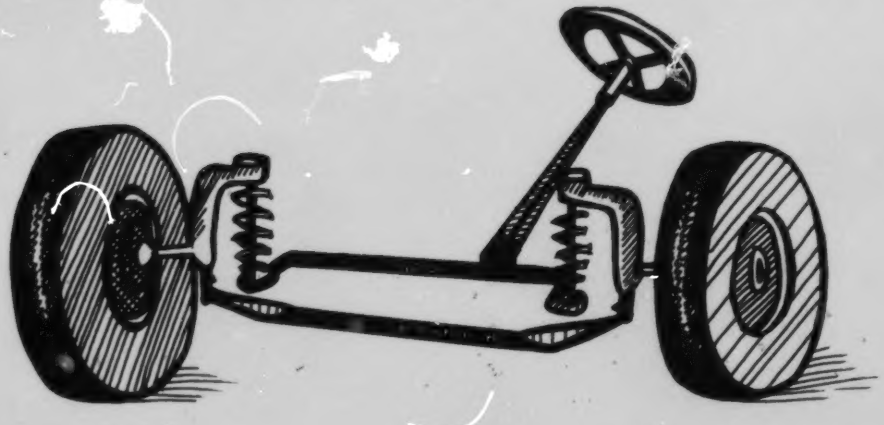
The functions of these chassis parts are shown in the next step.

B. Parts of the Chassis and their Functions.

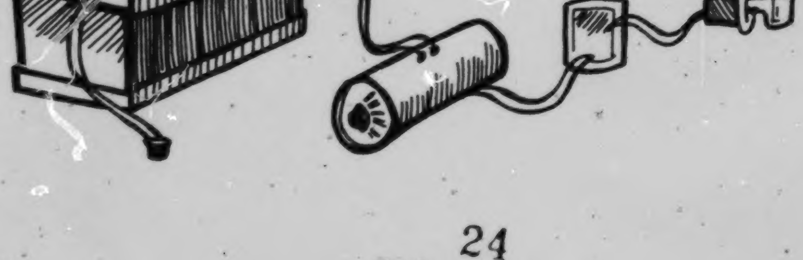
1. **ENGINE AND TRANSMISSION:** Produces power to turn the wheels and move the car. The engine uses combustion to provide this power.



2. **WHEELS, TIRES, STEERING AND SPRINGS:** Wheel and tires turn to allow the car to move. Steering is the control that directs the movement of the wheels. Springs absorb shock and bumps from the road which enables the car to ride softly over bumps and rough surfaces.



3. **ELECTRICAL SYSTEM:** Creates power to start the engine, run the radio and turn signals. The electrical system is made up of a battery alternator, regulator and electrical wiring.



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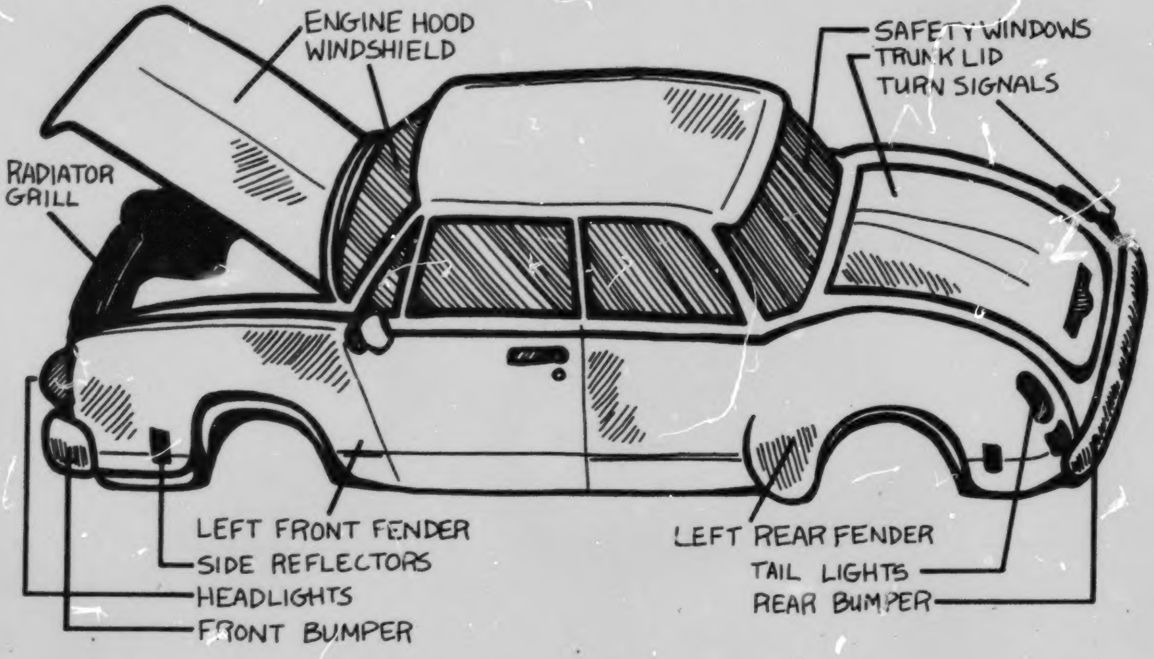
C. The Automobile Body.

The automobile body gives the car shape and beauty. It also provides safety features. Glass windows provide protection for your eyes. The trunk provides storage, and the fenders provide protection for the chassis. The picture below shows parts of an automobile body. Your knowledge about these parts enables you to take care of the car.


ENGINE HOOD
WINDSHIELD
SAFETY WINDOWS
TRUNK LID
TURN SIGNALS
RADIATOR GRILL
LEFT FRONT FENDER
SIDE REFLECTORS
HEADLIGHTS
FRONT BUMPER
LEFT REAR FENDER
TAIL LIGHTS
REAR BUMPER

1. Name safety features of an automobile body.

____

____

____

2. What is the difference between an auto body and an auto chassis?

____

____

____

____

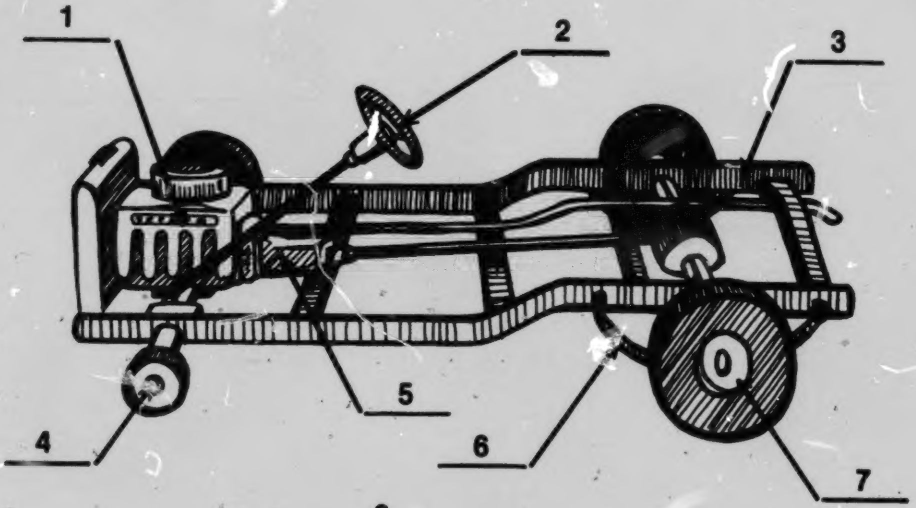
SEE YOUR INSTRUCTOR

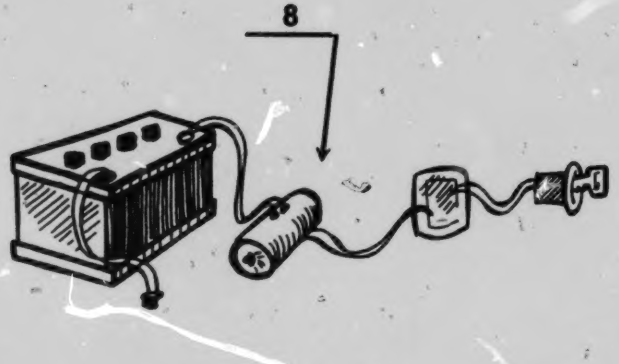
Unit 2
Major Parts of an Automobile

Auto Parts Identification Exercise

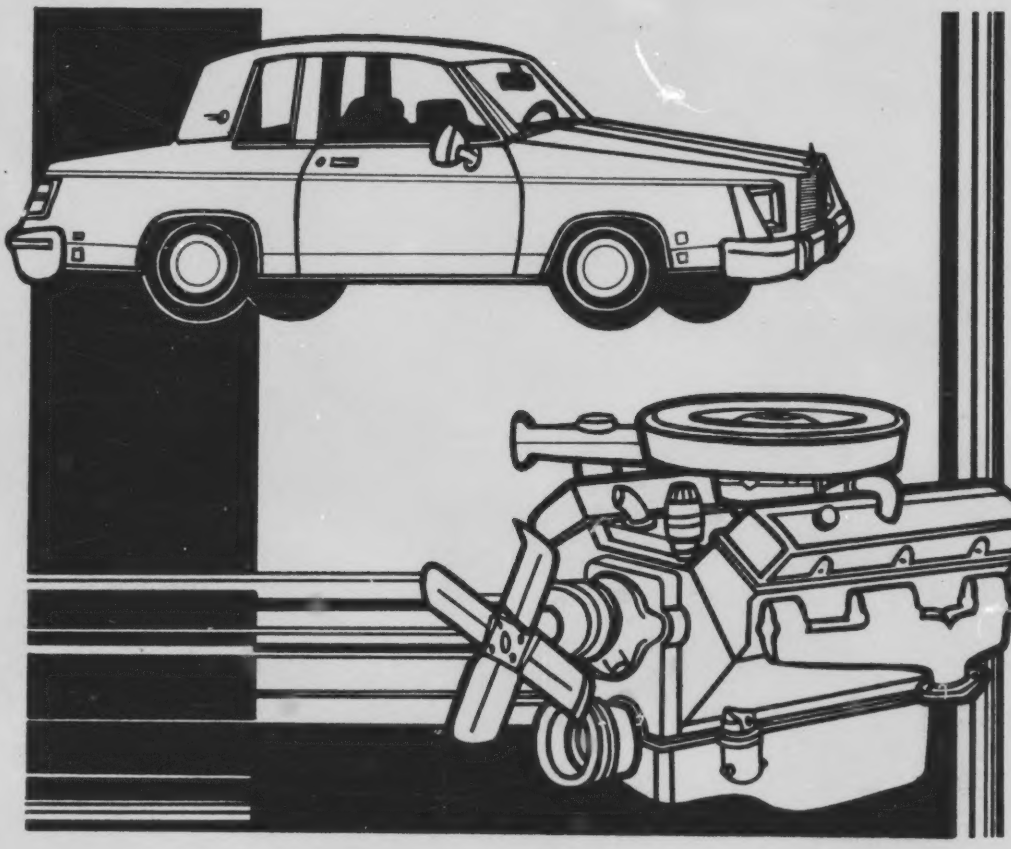
Match the words with the correct parts provided below.

____ A. Wheel and Tire
____ B. Automobile Engine
____ C. Electrical System
____ D. Steering Wheel
____ E. Transmission
____ F. Chassis
____ G. Springs
____ H. Brakes





Vocational Preparation Curriculum
AUTO SERVICE



Unit 3

Auto Service Safety Rules

Developed by: Hogan Usoro

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Unit 3
Auto Service Safety Rules

Auto Service Safety Rules

After your study this lesson, you should be able to:

1. Identify an unsafe work situation in an auto shop.
2. Identify improper use of an automotive tool.
3. Talk about general safety rules to be observed in an auto shop.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ I can do all the tasks above and want my instructor to give me the Practical Exercise.

SEE YOUR INSTRUCTOR

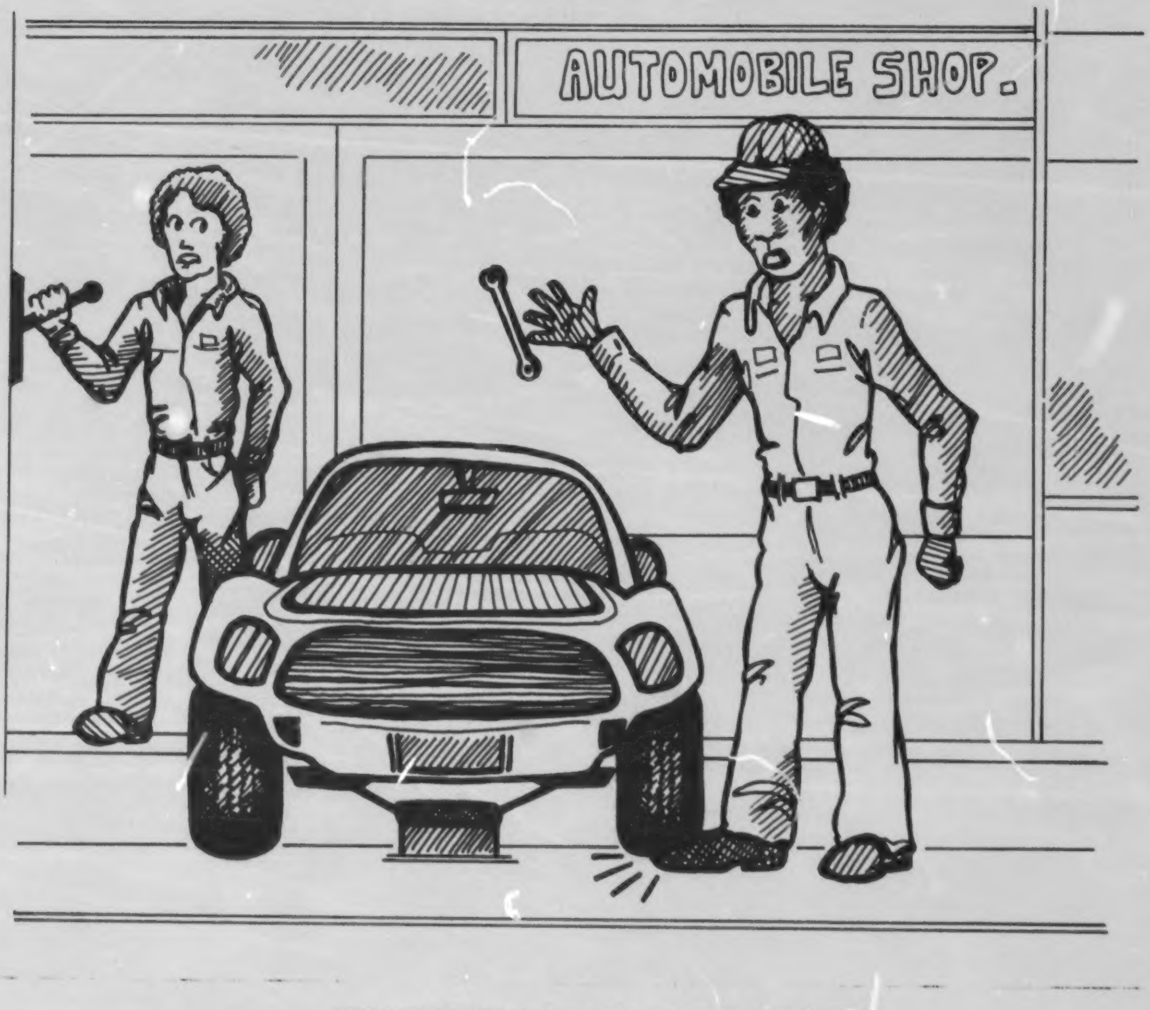
2. ☐ I want to study the information in this unit before I do the Practical Exercise.

TURN THE PAGE AND BEGIN

Unit 3
Auto Service Safety Rules

Introduction

You must work safely in an auto shop if you want to do a good job. Your ability to use tools, materials and equipment safely will make your work much easier. This unit will show you certain safety rules and precautions which should be observed in the auto shop to help you avoid accidents or injury.


AUTOMOBILE SHOP.

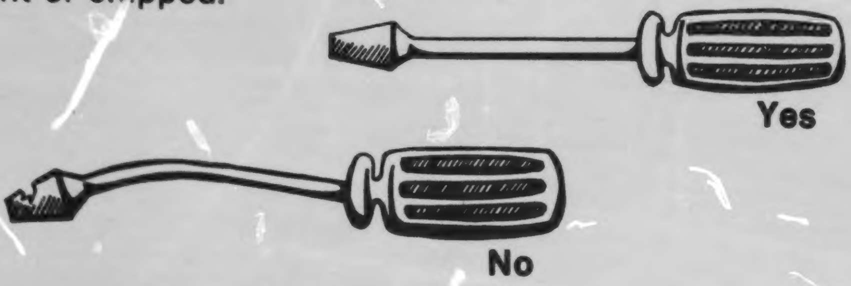
TURN TO NEXT PAGE

Unit 3
Auto Service Safety Rules

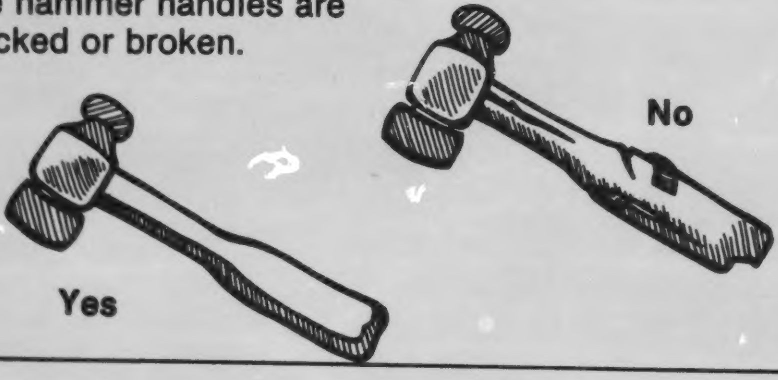
A. Safety Rules for Using Auto Shop Tools.

Always check hand tools before you use them.

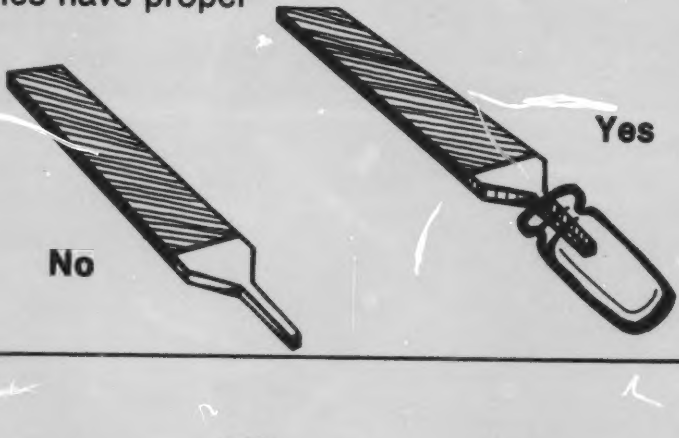
Be sure screwdrivers are not bent or chipped.



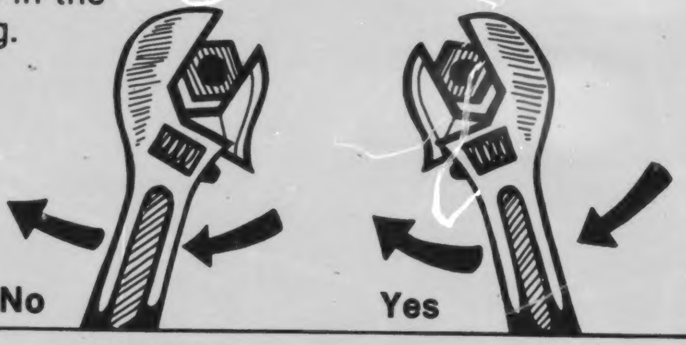
Be sure hammer handles are not cracked or broken.



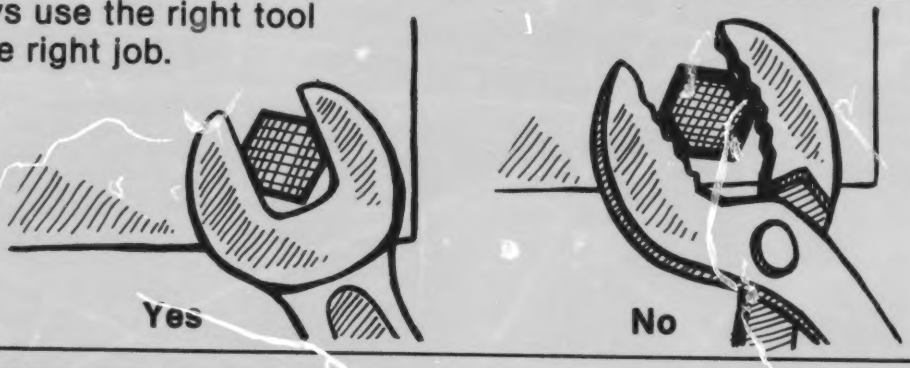
Be sure hand files have proper handles.



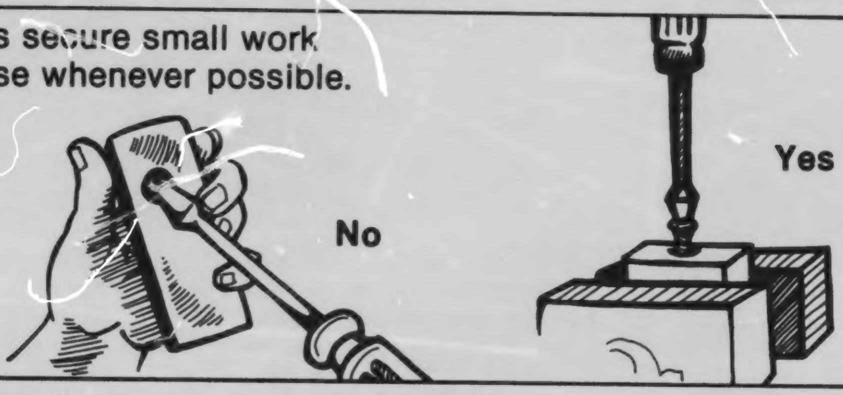
Always position wrench in the direction you are pulling.



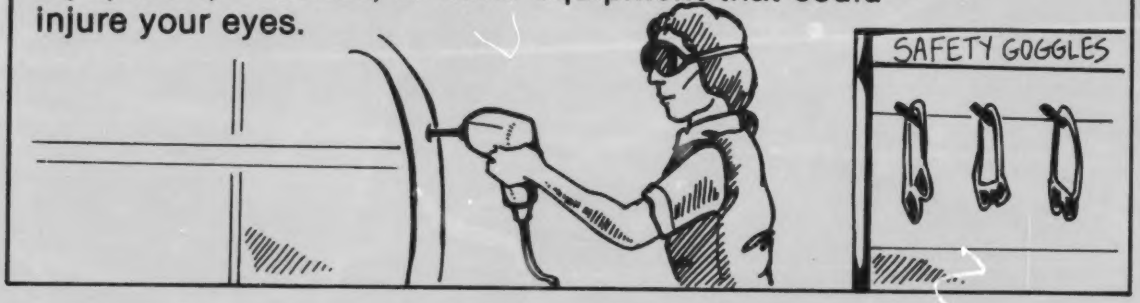
Always use the right tool for the right job.



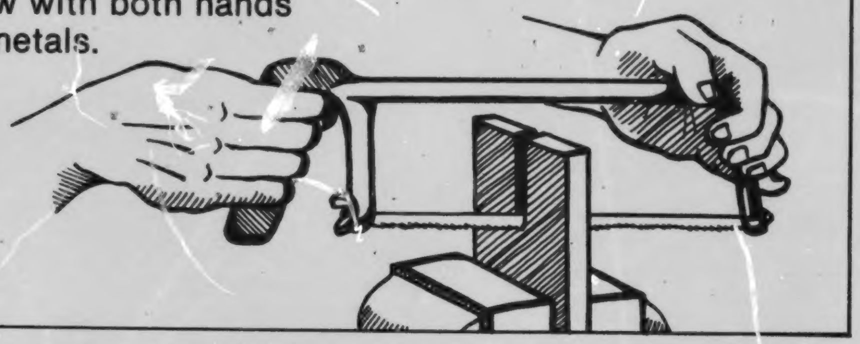
Always secure small work in a vise whenever possible.



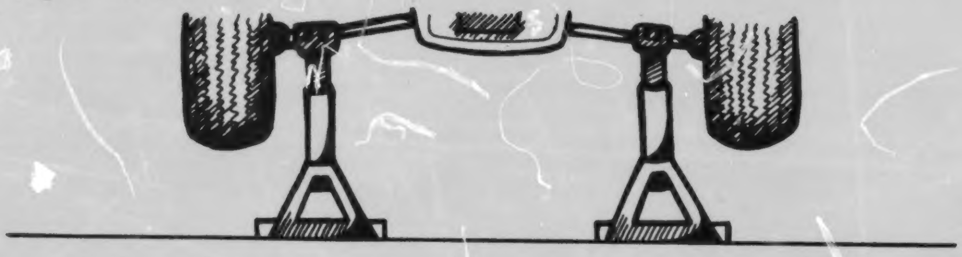
Always wear your safety goggles when you use power equipment, batteries, or other equipment that could injure your eyes.


SAFETY GOGGLES

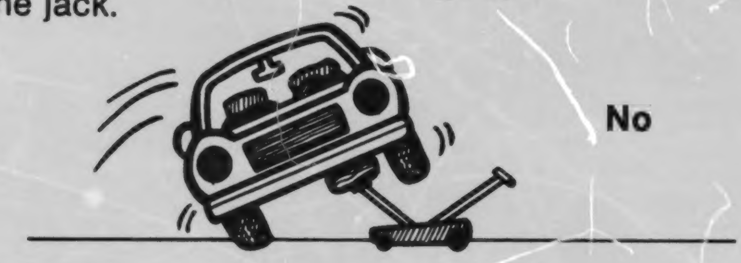
Hold a hacksaw with both hands while cutting metals.



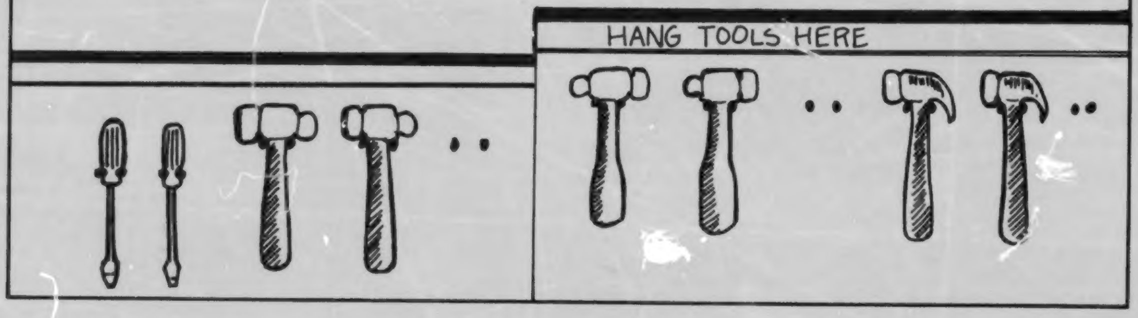
Always support a raised vehicle on jack stands before you get under it.



Never extend the height of a jack with supports under or on top of the jack.



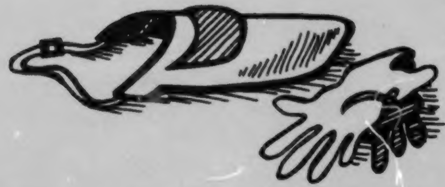
Always return tools and clean your work area.

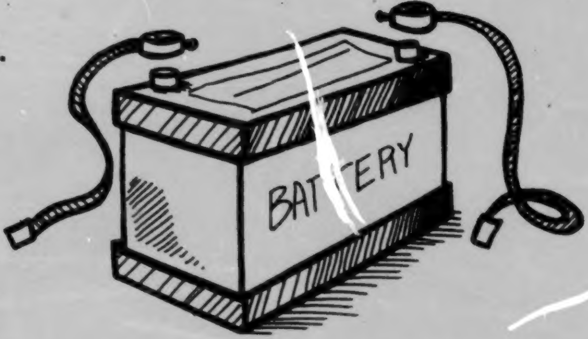


B. General Auto Shop Safety Rules.

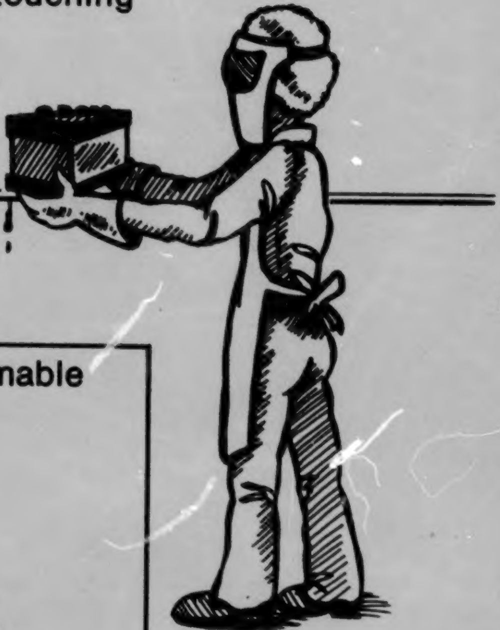
Never allow the ends of battery cables to touch. An electrical explosion will occur if they touch.

Never work on a battery without wearing a face shield.

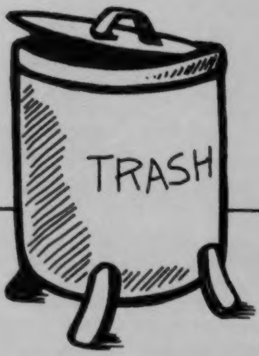


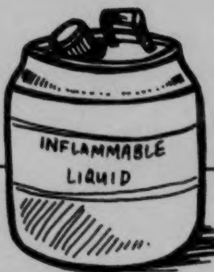


Always hold the battery away from your body. This prevents leaking battery acid from touching your clothes or skin. Wash your skin or clothing if you get battery acid on them.



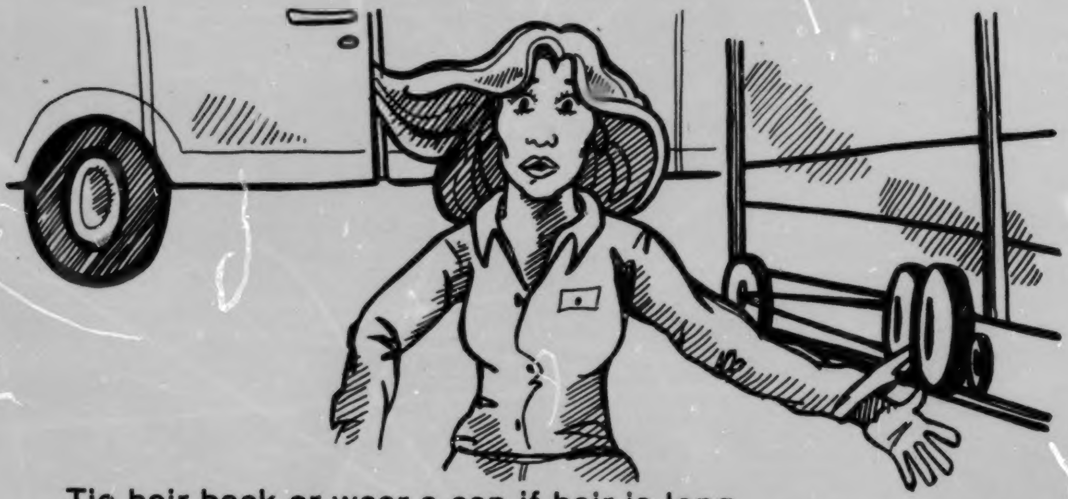
Always store oily rags, paper and inflammable liquids in fire-resistant containers.





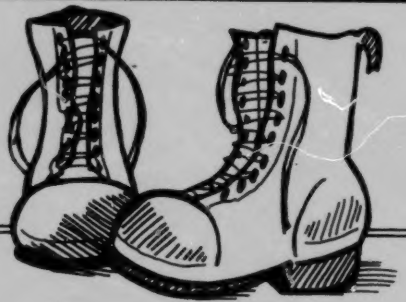
C. Safety Rules Concerning your Behavior and Appearance.

Do not wear loose clothing, neckties, scarves, rings, or jewelry which could get caught in moving equipment.

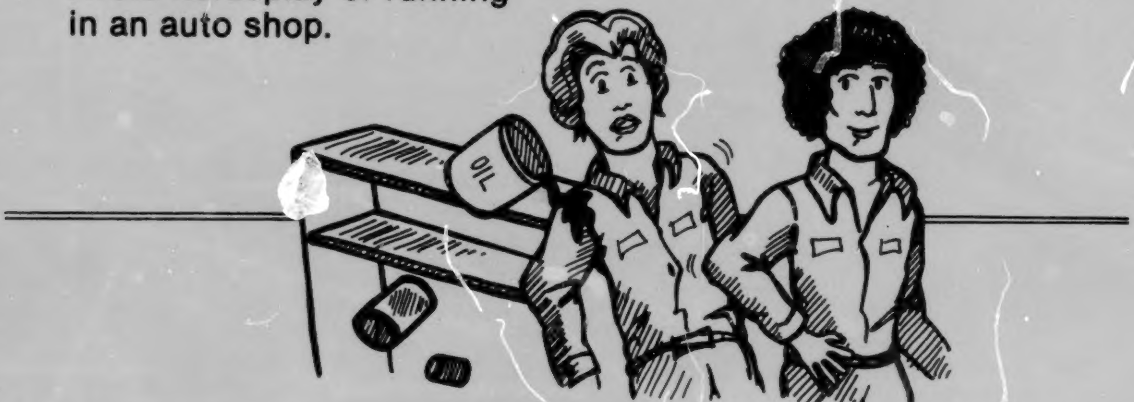


Tie hair back or wear a cap if hair is long.
This prevents getting it caught in moving parts of machinery.

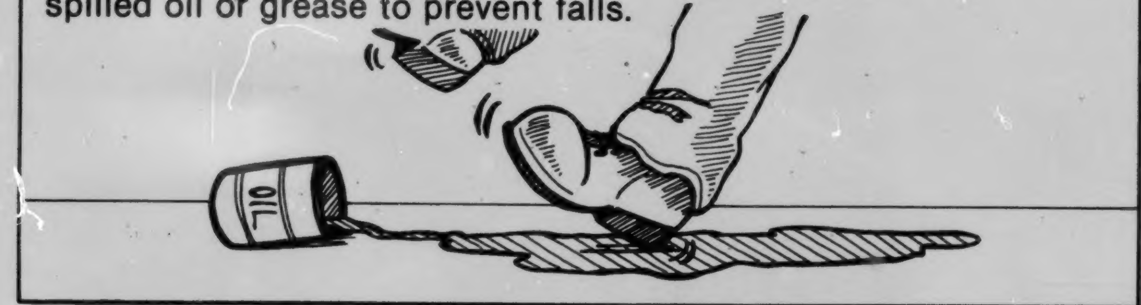
Always wear hardsole work boots in the auto service shop.



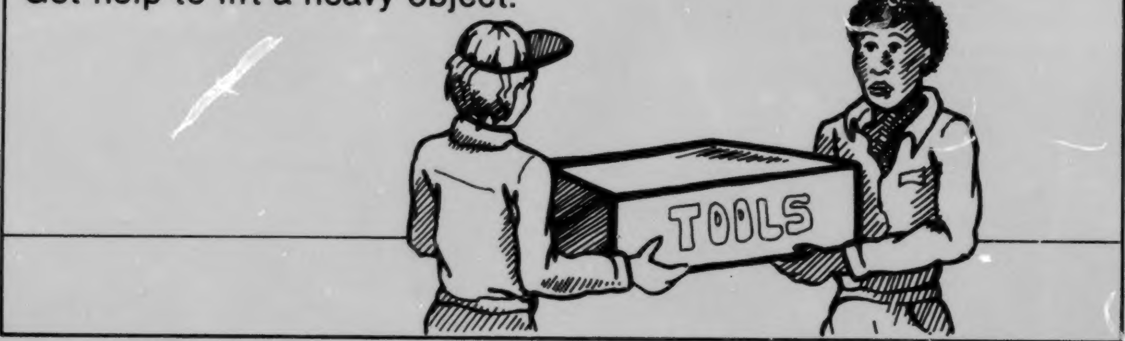
Avoid horseplay or running in an auto shop.

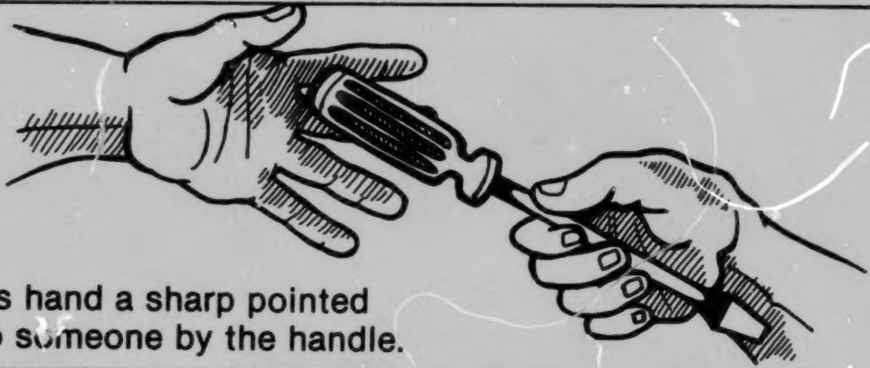


Always remove objects from the floor and wipe up any spilled oil or grease to prevent falls.



Get help to lift a heavy object.

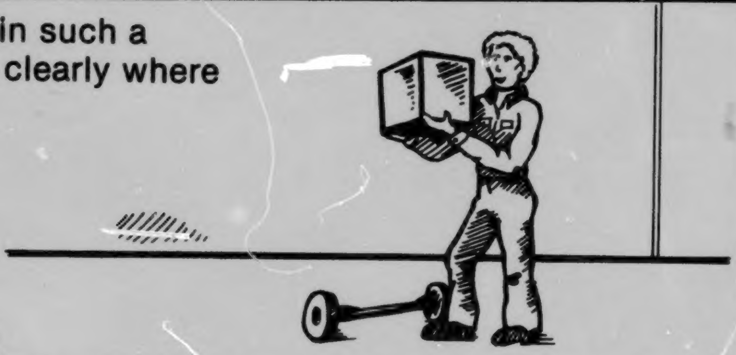




Always hand a sharp pointed tool to someone by the handle.

Always carry objects in such a way that you can see clearly where you are going.

Report all accidents to your instructor, no matter how small they may seem to be.



SEE YOUR INSTRUCTOR

Unit 3
Auto Service Safety Rules

Practical Exercise Performance Checklist

Student's Name: ______________________________

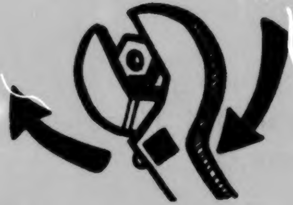
True-False Questions:
Circle "T" if the statement is True and "F" if it is False.

T F 1. You can still safely use a hammer which has a cracked handle.

T F 2. It is unsafe for you to use files that do not have proper handles.

T F 3. It is not necessary to wear safety goggles when drilling metals with a power tool.

T F 4. This picture shows the correct way to turn a wrench.



T F 5. It is dangerous to leave a car on a jack with no jack stands supporting it.

T F 6. There is no problem if battery cables touch each other.

T F 7. It is always a safe practice for you to place oily rags and papers in a fire-resistant container.

T F 8. Wearing goggles when working on a car battery needs to be done only in the classroom.

T F 9. It is not good to wear loose clothing while you are working on moving equipment.

T F 10. Hardsole work boots are preferred in the workshop.

T F 11. You do not have to remove objects on the shop floor if you did not put them there.

T F 12. Horseplay or running in an auto service shop can be fun and safe.

T F 13. It is a good work habit to wipe spilled water, grease and oil from the shop floor.

T F 14. It is not important to report minor shop room accidents to your instructor.

T F 15. Do not ask other people for help if you have to lift a heavy object and they are busy.

T F 16. When handing a sharp pointed tool to another person, always point the handle toward that person.

T F 17. You work better and safer if you use the right tool for the right job.

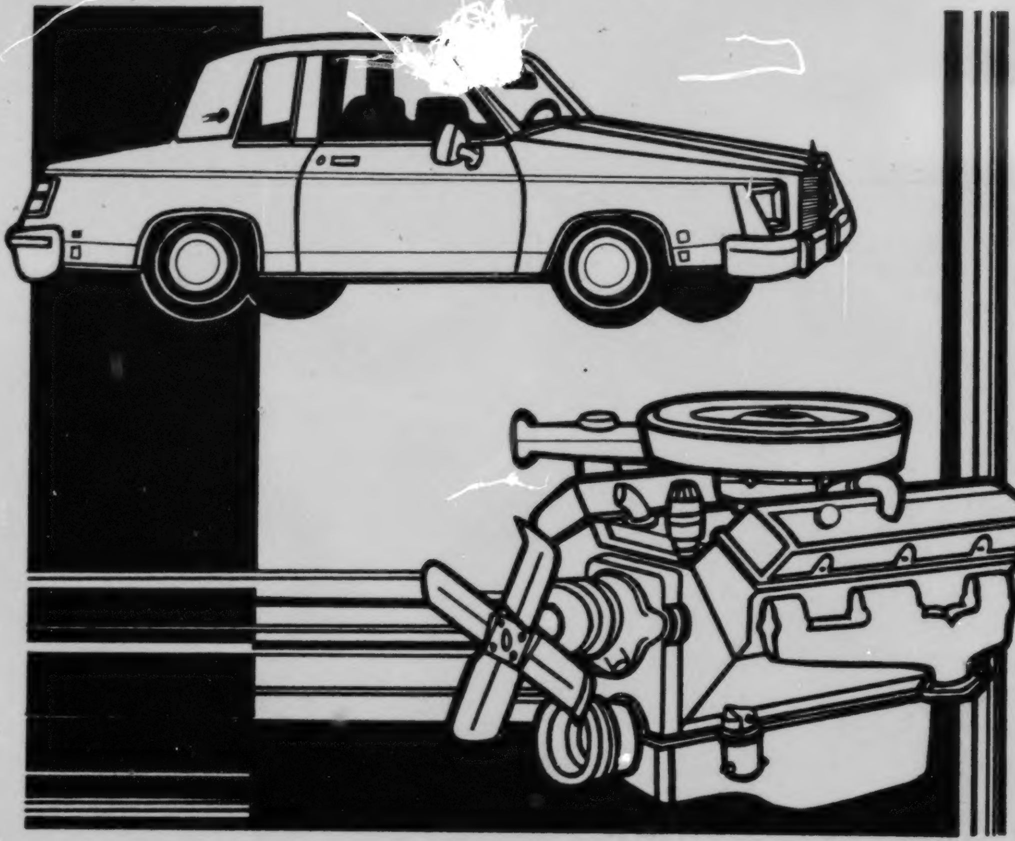
Satisfactory Performance ☐
Repeat Exercise ☐
Should Move On ☐

Instructor's Signature

Date

37

Vocational Preparation Curriculum
AUTO SERVICE



Unit 4

Changing the Engine Oil and Oil Filter

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION
iml
INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

Unit 4

Changing the Engine Oil and Oil Filter

Changing the Engine Oil and Oil Filter

After you study this lesson, you should be able to:

1. Identify tools, materials and equipment used to change engine oil and the oil filter.
2. Change the engine oil and replace the oil filter.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

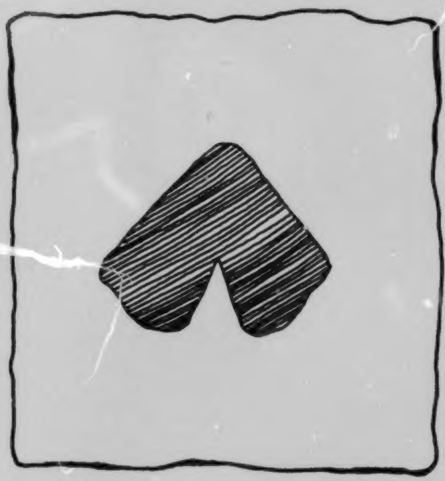
2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

TURN THE PAGE AND BEGIN

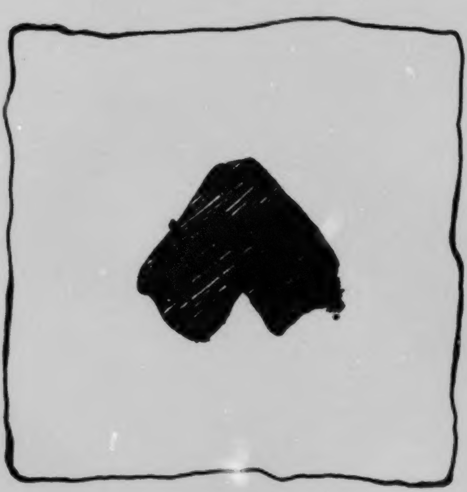
Unit 4
Changing the Engine Oil and Oil Filter

Introduction

One of the simplest and most important steps in maintaining a car is to change the oil and oil filter. Clean oil helps the moving parts of the engine to function smoothly and not wear out as quickly. The oil filter catches dirt in the oil and keeps it from circulating through the engine. To check engine oil, raise the car hood, remove the dipstick, wipe it on a clean paper towel and observe the stain.



A uniformly light stain indicates the the oil is still clean.



Black color, milky appearance or dirt particles indicates that the oil is dirty and needs changing.

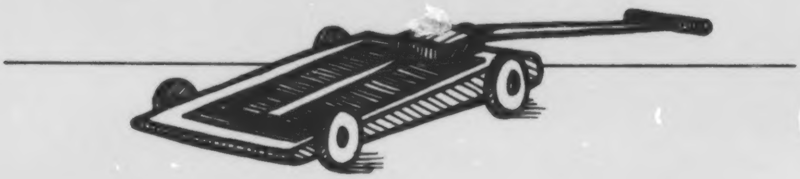
In this lesson you will learn how to change the oil and oil filter.

TURN TO NEXT PAGE

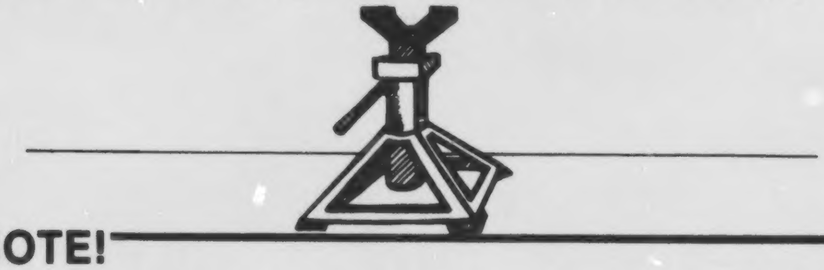
Unit 4
Changing the Engine Oil and Oil Filter

A. Tools, Materials and Equipment for Changing the Engine Oil and Oil Filter.

1. **JACK:** Used to raise a car to gain access beneath it.

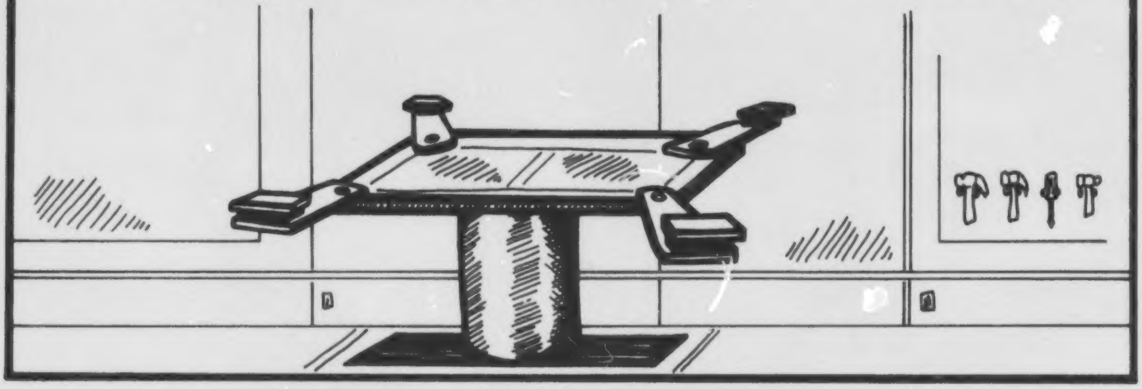


2. **JACK STAND:** Used to support a raised car for safety.

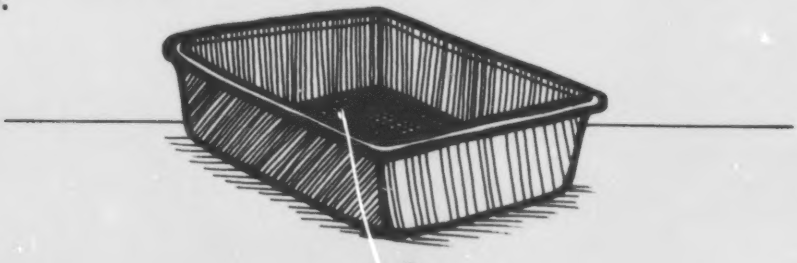


NOTE!

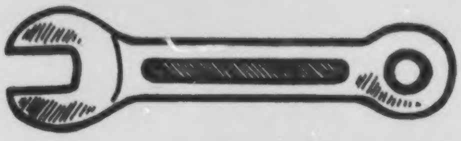
HYDRAULIC LIFT: Can be used to raise the entire automobile.



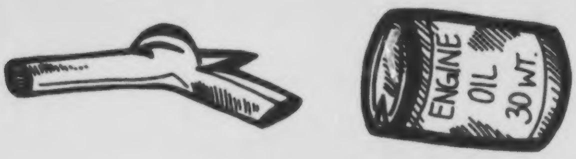
3. **DRAIN PAN:** Used to collect oil as it drains from the car engine.



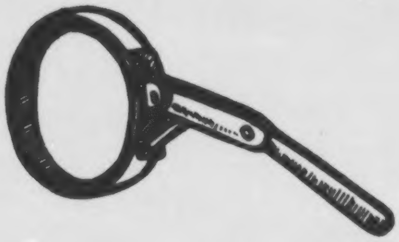
4. **WRENCH:** Tool used to loosen drain plug on engine oil pan.



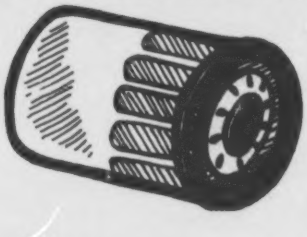
5. **OIL POUR SPOUT:** Used to pour oil from can into the engine.



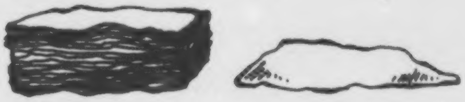
6. **OIL FILTER WRENCH:** Used to remove oil filter from the engine.



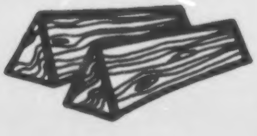
7. **OIL FILTER:** Container attached to the engine to filter dirt from the oil.



8. **SHOP TOWEL:** Cloth used to clean oil spills on the engine and to wipe oil off hands.



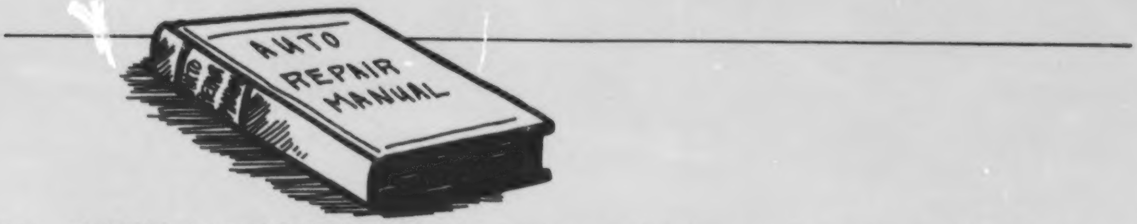
9. **WOOD BLOCK:** Used to block tires of a raised car.



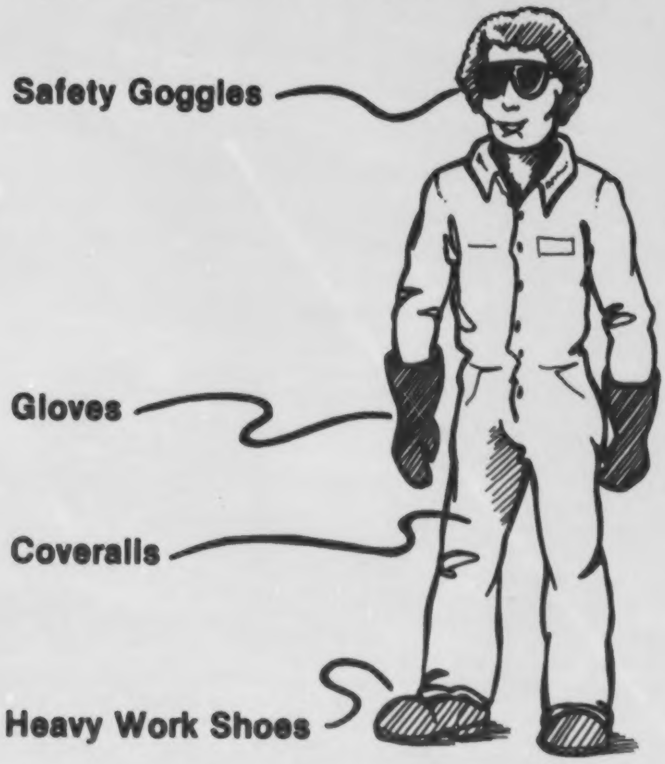
10. **ENGINE OIL:** Lubricant used to keep the engine parts from wearing out as quickly.

ENGINE OIL 1 QT.

11. **AUTOMOTIVE REPAIR MANUAL:** Used to obtain specific information about a car.


AUTO REPAIR MANUAL

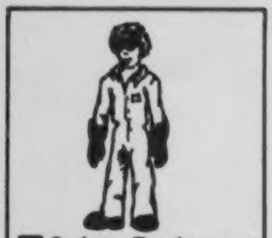
12. **SAFETY EQUIPMENT:** Used to protect a person from injuries.

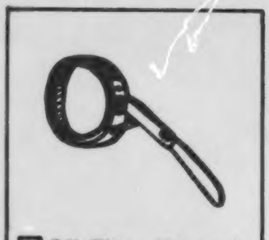

Safety Goggles
Gloves
Coveralls
Heavy Work Shoes

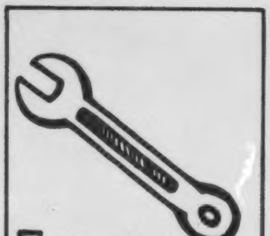
TURN TO NEXT PAGE

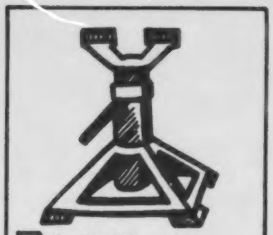
B. Steps for Changing the Engine Oil and Oil Filter.

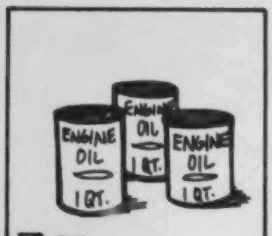
1. Find and Check Off the following:

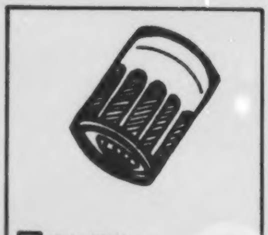

☐ Safety Equipment

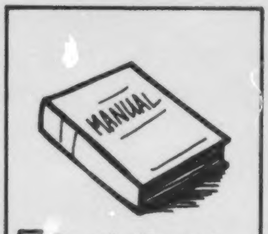

☐ Oil Filter Wrench

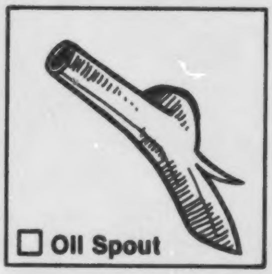

☐ Wrench

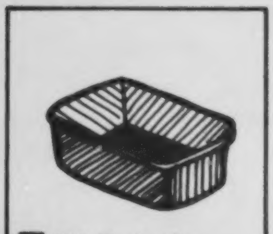

☐ Jack Stand

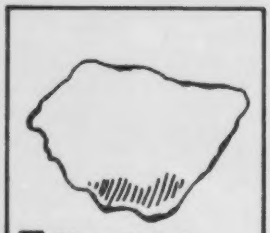

☐ Oil

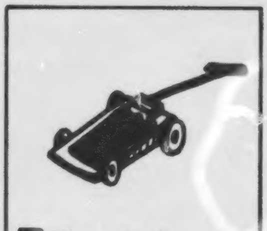

☐ Oil Filter

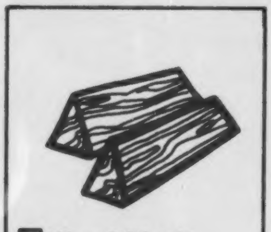

☐ Repair Manual


☐ Oil Spout

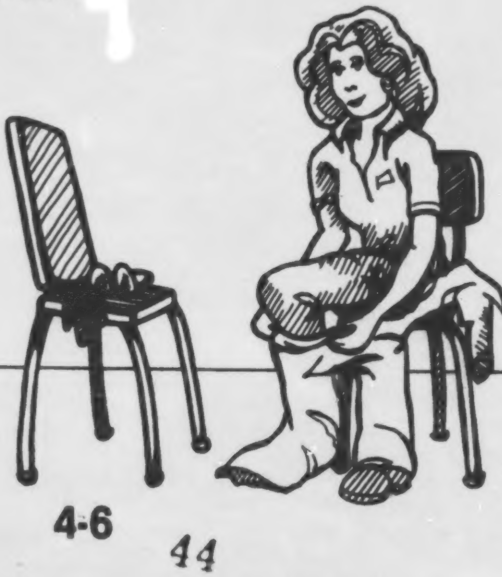

☐ Oil Drain Pan


☐ Shop Towels


☐ Floor Jack


☐ Wood Block

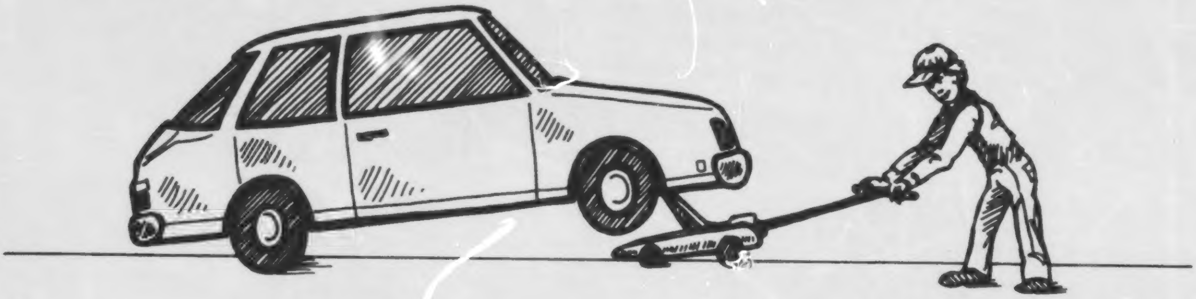
2. Wear proper safety equipment.



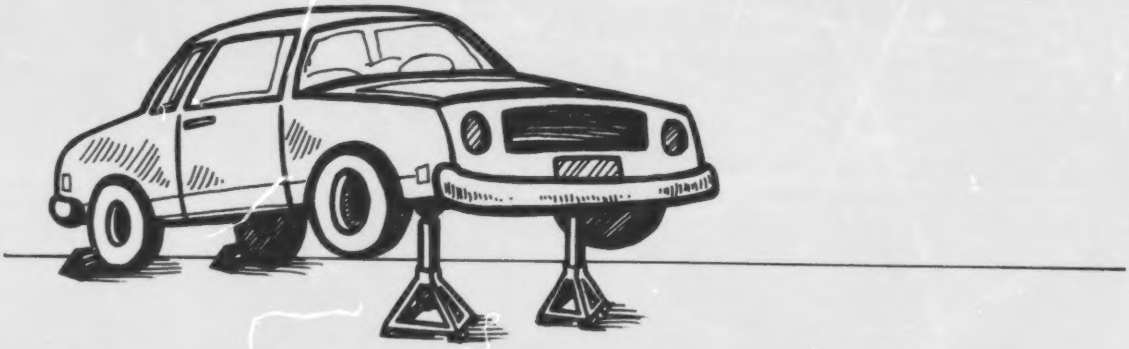
NOTE!

Set the emergency brake to prevent the vehicle from moving when it is jacked up.

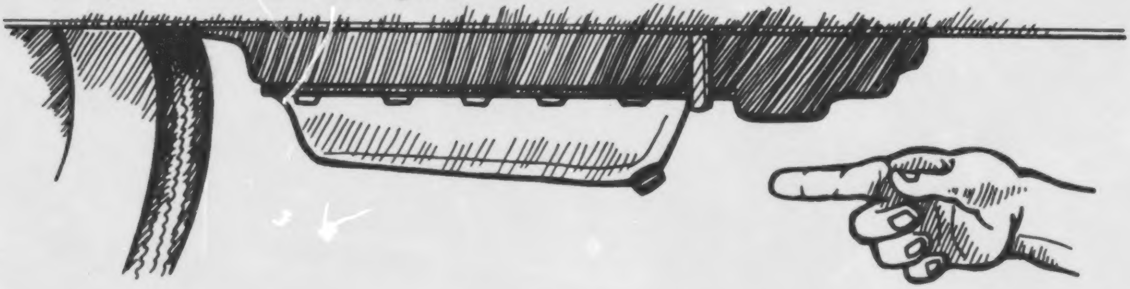
3. Place jack under a solid part of the car bumper or frame. Jack up the front of the car.



4. Support raised car with jack stands. Be sure jack stands are solidly in place and are supporting the car frame.

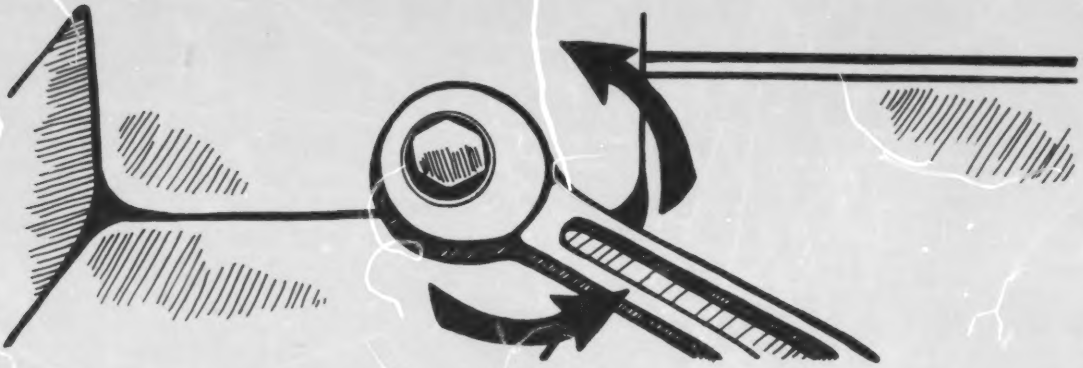


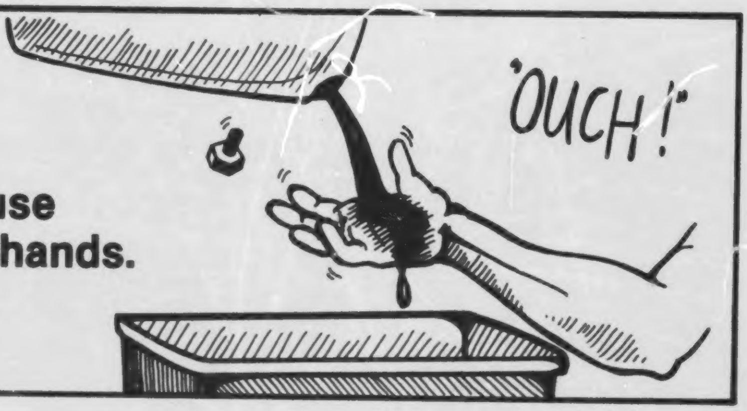
5. Position yourself under the vehicle and locate the oil drain plug on oil pan of engine.



Place oil drain pan under oil drain plug in a position to catch draining oil.

6. Loosen drain plug with a wrench by turning to the left.

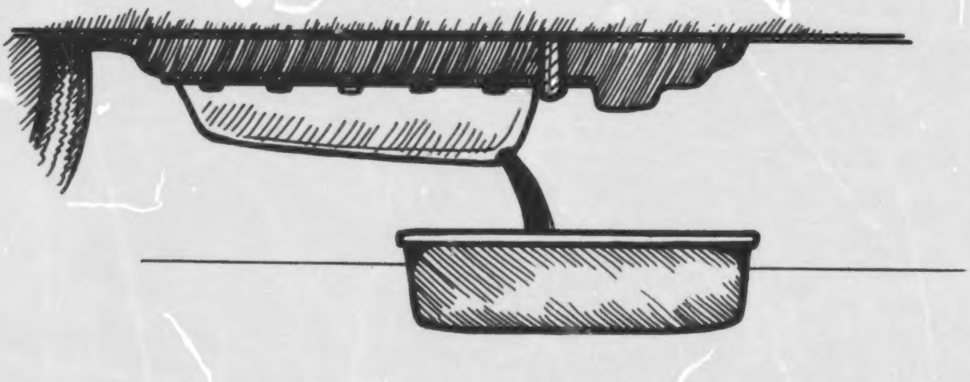




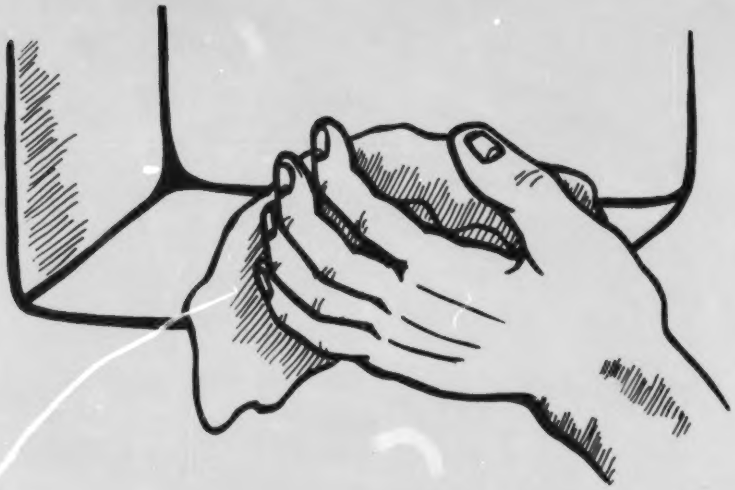
CAUTION!

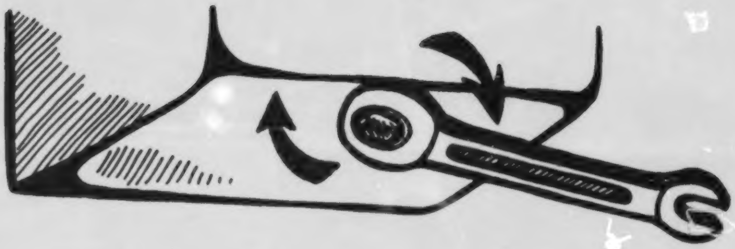
Be careful with the hot oil because it can burn your hands.

7. Unscrew plug slowly by hand until it is free. Pull it away quickly and allow oil to drain into pan.



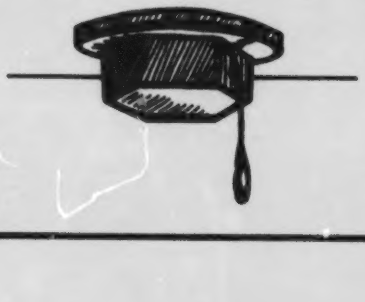
8. Wipe dirty oil from the drain plug and screw it back into the oil pan after dirty oil has completely drained out.





NOTE!

Do not damage any gasket or washer on the plug, it may cause the oil to leak.



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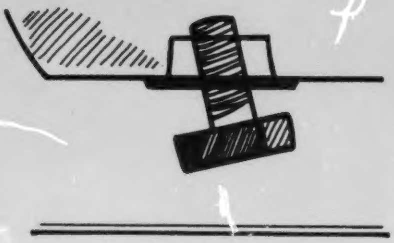
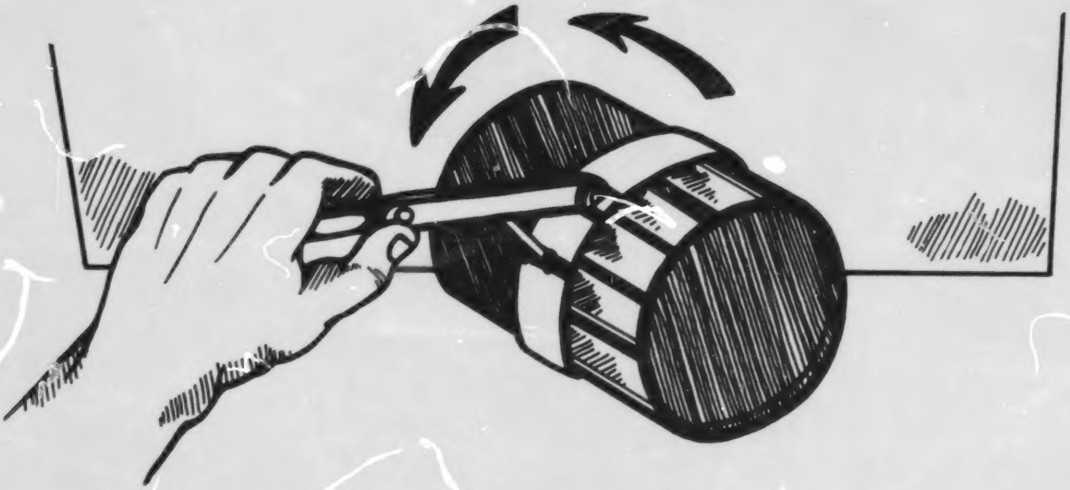
NOTE!

Be very careful that you do not crossthread the plug when you tighten it. Crossthreading is when the threads of the plug do not stay in the threads of the pan.

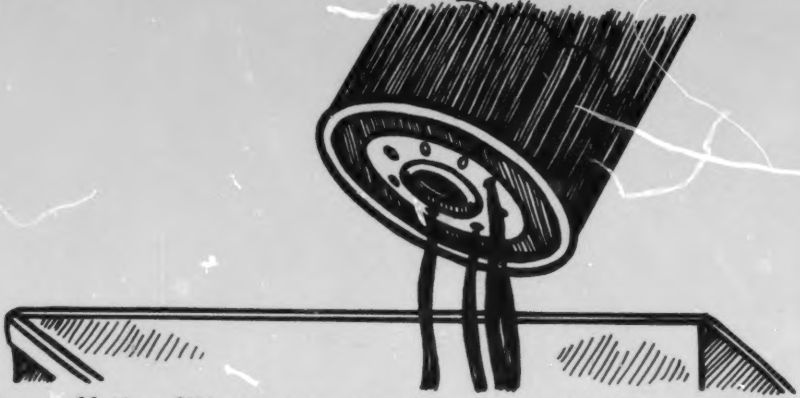


9. Move oil drain pan under the oil filter. Loosen oil filter with the oil filter wrench.



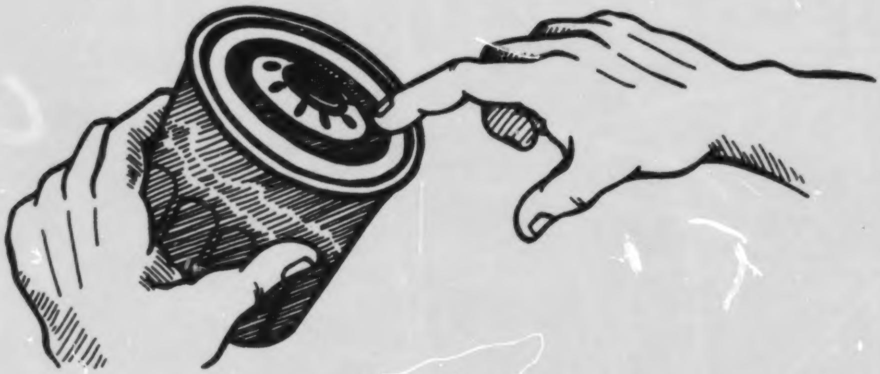
Finish unscrewing the oil filter with your hand and carefully remove it.

10. Empty filter oil into drain pan and throw away filter.

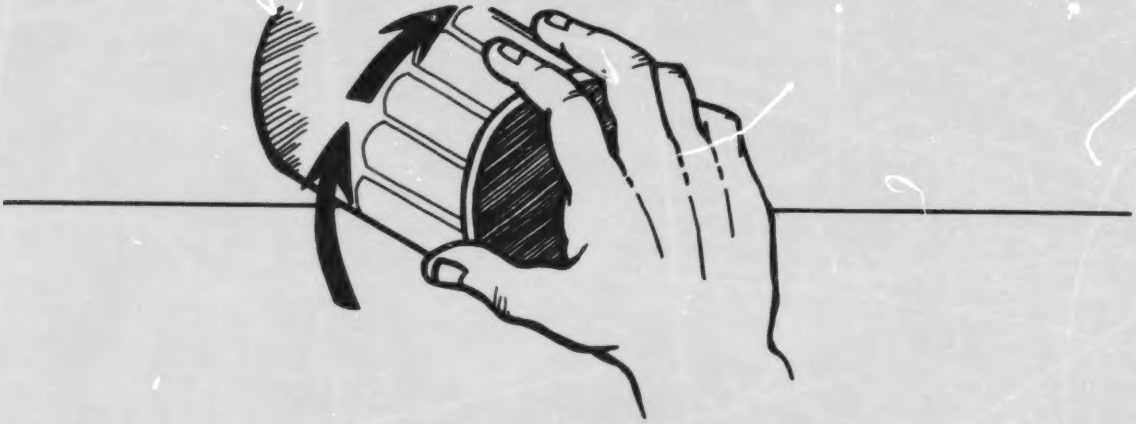


Wipe off the filter base on the engine with a clean cloth to remove dirt and old oil.

11. Get the new filter. Apply a thin film of fresh engine oil to the rubber seal ring.

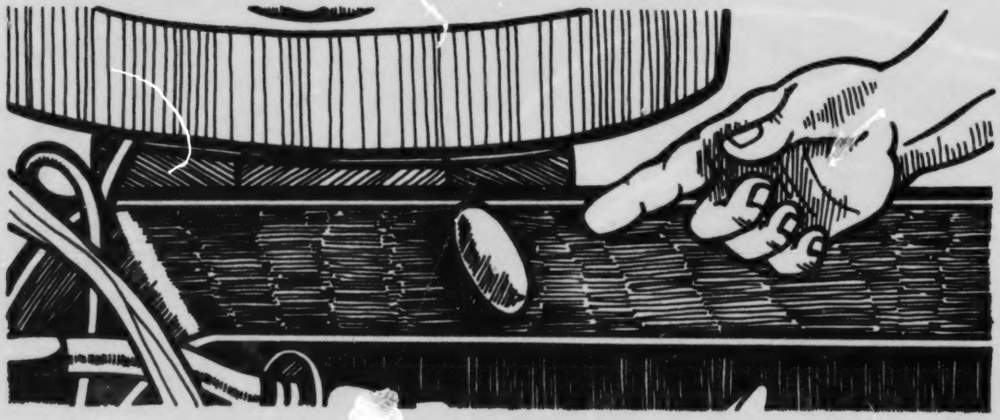


12. Carefully screw in the new oil filter ¾ of a turn by hand. Do not use the oil filter wrench to tighten.



13. Remove jack stands and lower vehicle.

14. Open the hood and locate the oil filter cap.



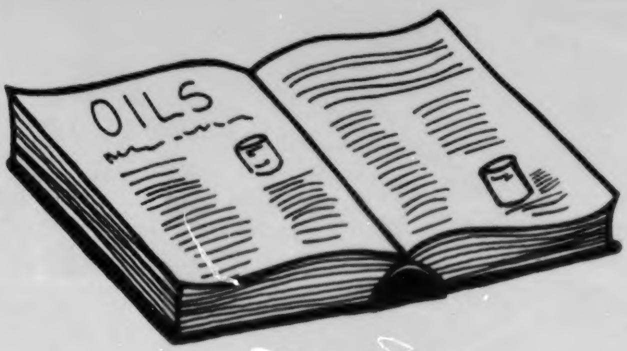
Remove the oil filter cap.

NOTE!

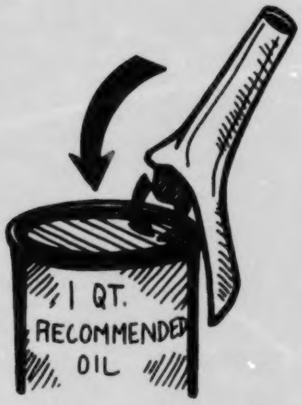
Check the auto service manual for correct amount of oil the engine will hold.

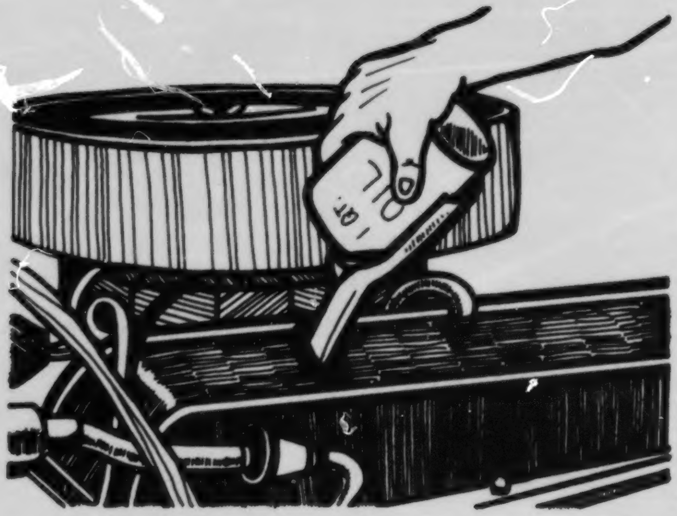
AUTO
SERVICE
MANUAL

15. Select oil recommended by the auto manufacturer.



16. Pour oil into engine.

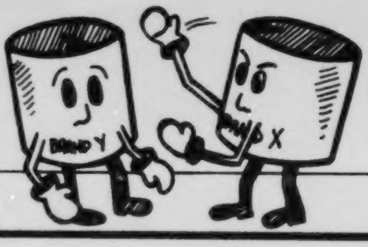

1 QT.
RECOMMENDED
OIL



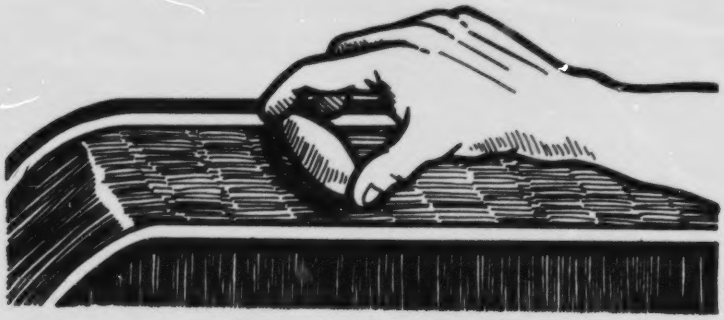
Continue this procedure until correct amount of oil is in the engine.

NOTE!

Do not mix different brands of oil, they might not work well together.

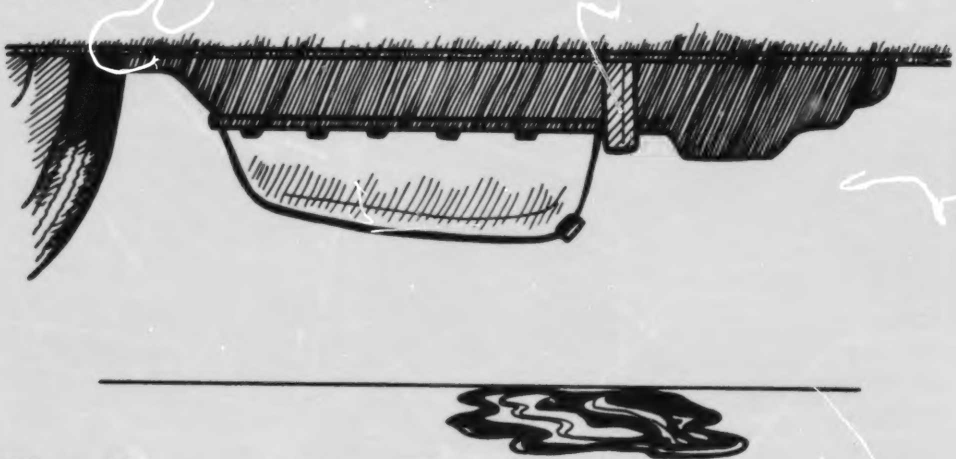


17. Replace the oil filter cap.



18. Start the car engine and let it idle for a few minutes. Turn off engine.

19. Check under car for any oil leakage. If there is any leakage, tighten the oil filter or plug.



Wipe off excess oil.

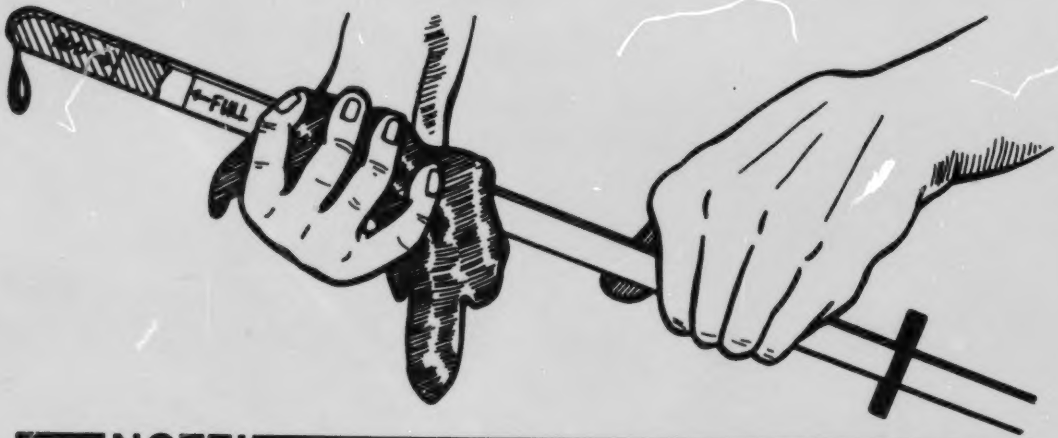
20. Start engine again and let it run. Once more turn it off and check for oil leakage.

NOTE!

If it is still leaking you probably have a defective gasket. See your instructor.

21. Check engine oil level as follows:

- Remove dipstick and wipe clean with a cloth.
- Insert dipstick into the oil again and remove it.
- Observe oil level on the dipstick.
- Add more oil if necessary or until the oil level reaches the full mark on the dipstick.



NOTE!

Do not add oil above the quantity recommended by the auto manufacturer.

22. Close the car hood. Clean up your work area and return tools to their proper places.

SEE YOUR INSTRUCTOR

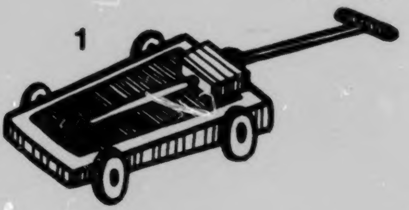
Unit 4
Changing the Engine Oil and Oil Filter

Tools and Materials Identification Exercise

Match the words with the correct objects provided below.

______ A. Jack Stand
______ B. Car Jack
______ C. Drain Pan
______ D. Wrench
______ E. Oil Pour Spout
______ F. Oil Filter Wrench
______ G. Oil Filter
______ H. Wood Block
______ I. Automotive Repair Manual
______ J. Shop Towel

1



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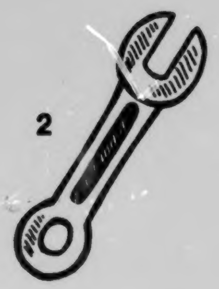

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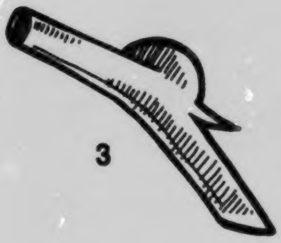

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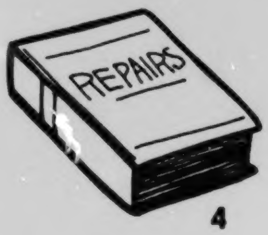

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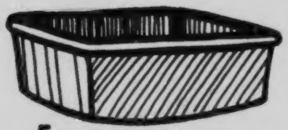

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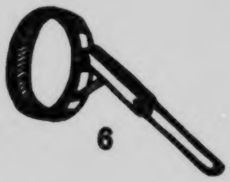

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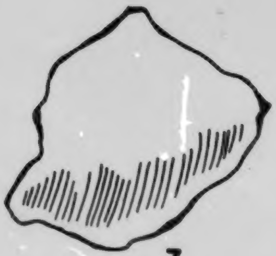

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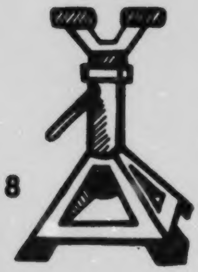

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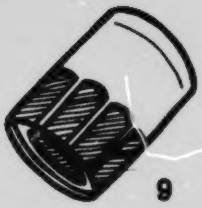

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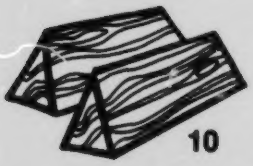


Unit 4
Changing the Engine Oil and Oil Filter

Practical Exercise Performance Checklist

The student ____________________ successfully performed the following tasks:

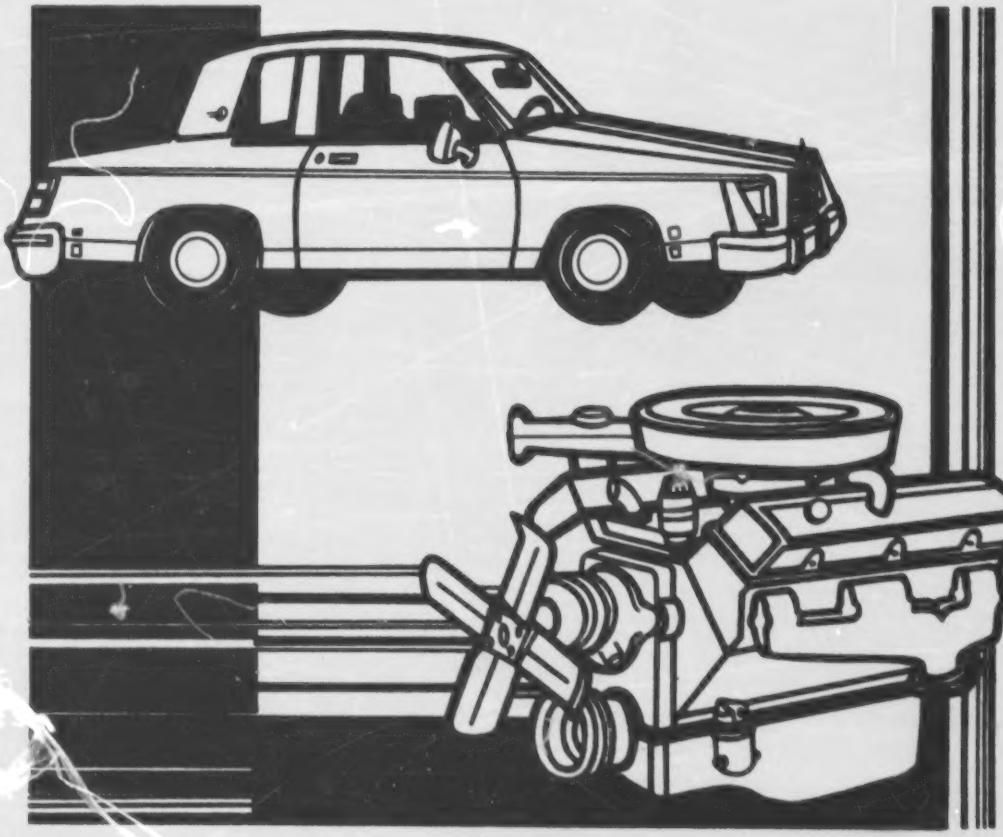
Tasks	Yes	No	Comments
1. Identified:			
a. Jack stand			
b. Car jack			
c. Drain pan			
d. Wrench			
e. Oil pour spout			
f. Oil filter wrench			
g. Oil filter			
h. Wood block			
i. Automotive repair manual			
j. Shop towel			
2. Wore proper safety equipment.			
3. Set the hand brake, placed jack and raised car.			
4. Supported car with jack stands.			
5. Located the drain plug.			
6. Loosened and removed the drain plug.			
7. Drained oil into a pan.			
8. Cleaned drain plug and replaced it after oil had drained.			
9. Lowered vehicle and opened hood.			
10. Placed drain pan under oil filter.			
11. Emptied filter into drain pan.			
12. Cleaned engine filter base and applied film of oil on new filter.			

Tasks	Yes	No	Comments
13. Properly installed and tightened the new filter.			
14. Properly removed the oil filter cap.			
15. Checked the service manual for correct oil and amount.			
16. Poured oil into engine.			
17. Replaced oil filter cap.			
18. Checked filter for leakage.			
19. Checked oil level with dip stick and added oil as necessary.			
20. Closed the hood, cleaned work area and returned tools to their proper places.			

Satisfactory Performance ☐
Repeat Exercise ☐
Should Move On ☐

Instructor's Signature ______________________ Date __________

Vocational Preparation Curriculum
AUTO SERVICE



Unit 5

Lubricating the Auto Chassis and Body

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION
IML
INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

Unit 5
Lubricating the Auto Chassis and Body

Lubricating the Auto Chassis and Body

After you study this lesson, you should be able to:

1. Identify tools and materials used to lubricate an auto chassis and body.
2. Lubricate the auto chassis.
3. Lubricate the auto body.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ I can do all the tasks above and want my instructor to give me the Practical Exercise.

SEE YOUR INSTRUCTOR

2. ☐ I want to study the information in this unit before I do the Practical Exercise.

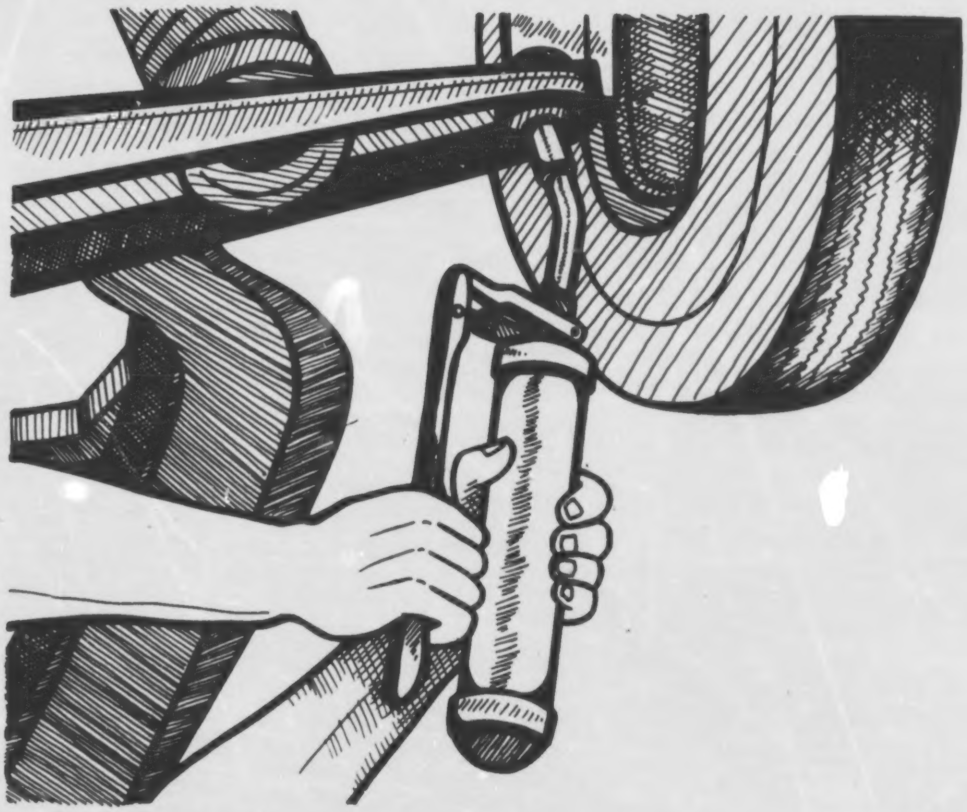
TURN THE PAGE AND BEGIN

Unit 5
Lubricating the Auto Chassis and Body

Introduction

Automotive joints must be lubricated often to reduce friction between the moving parts. Friction is caused by one object rubbing against another. Friction between two moving parts causes those parts to wear out quicker. Grease is usually applied to lubricate the spot where friction occurs.

This unit will show you where to look for joints that need to be lubricated. You will also learn how to lubricate the auto chassis and body correctly.



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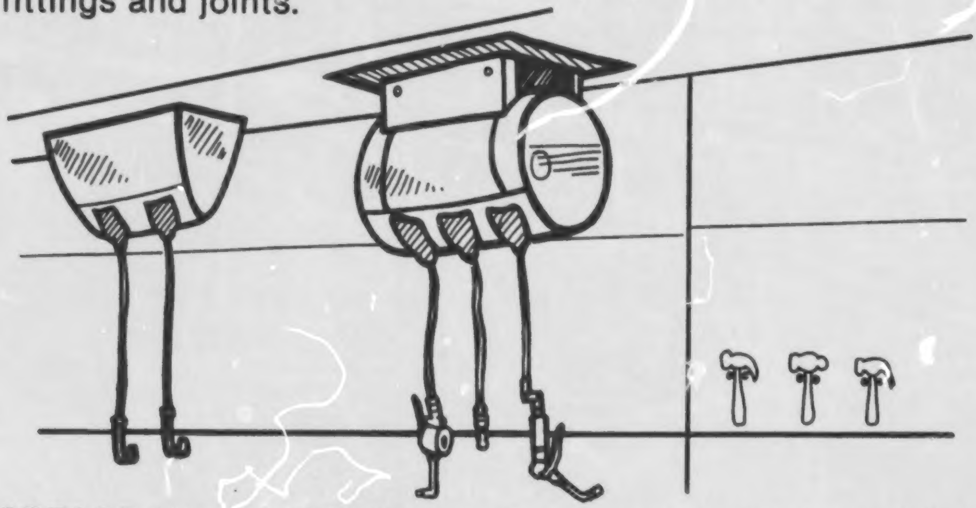
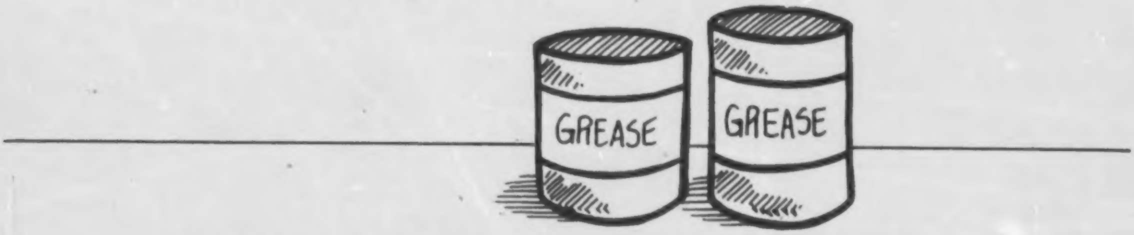
Unit 5
Lubricating the Auto Chassis and Body

A. Tools, Materials and Equipment for Lubricating the Auto Chassis and Auto Body.

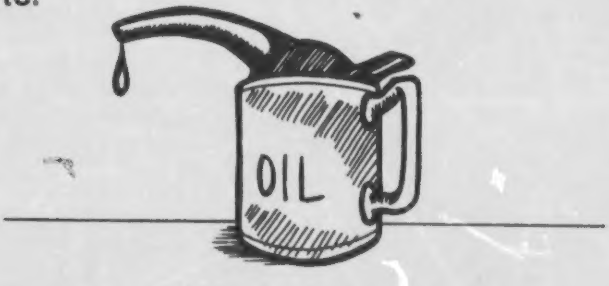
1. **GREASE GUN:** Tool used to force grease into auto fittings and joints.



2. **GREASE LUBRICANT:** Oil substance used to lubricate joints between moving parts.



3. **OIL CAN:** Oil container used to apply small amounts of oil to auto parts.



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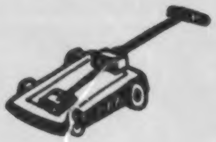
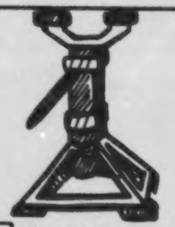
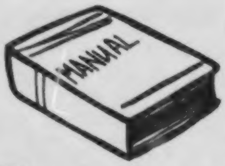
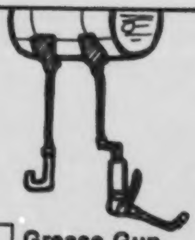
B. Steps for Lubricating the Auto Chassis.

1. Find and Check Off the following:


☐ Car Jack


☐ Jack Stands


☐ Service Manual

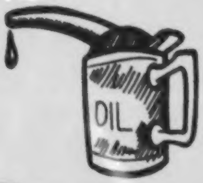


☐ Grease Gun

☐ Wrench

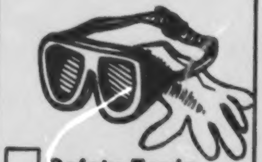
GREASE
GREASE

☐ Chassis Lubricant

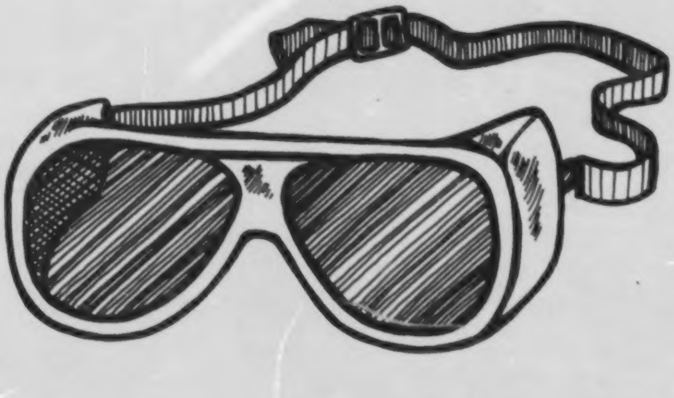


☐ Oil Can

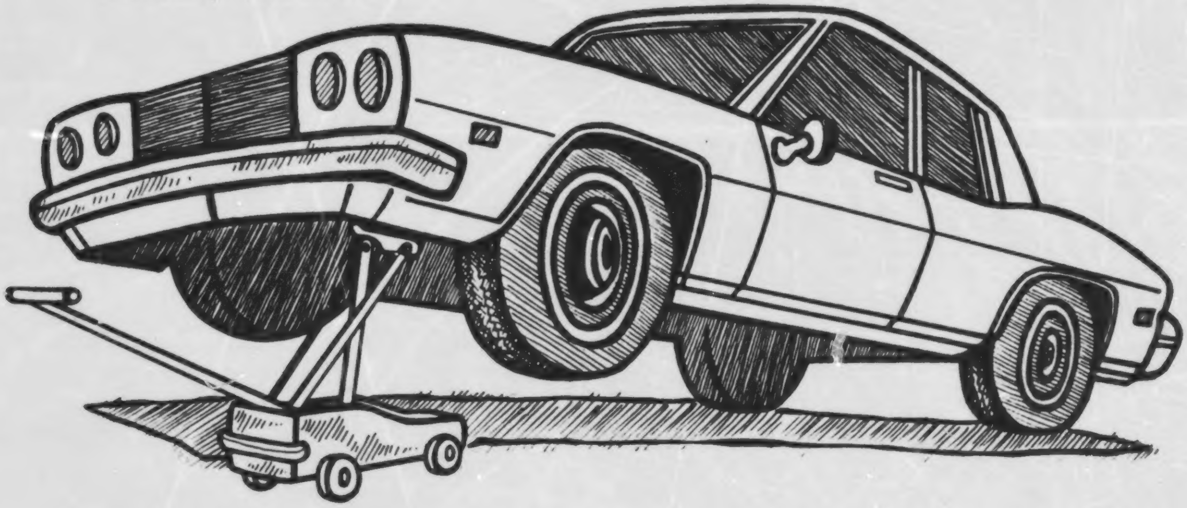
☐ Shop Towels


☐ Safety Equip.

2. Wear proper safety equipment.

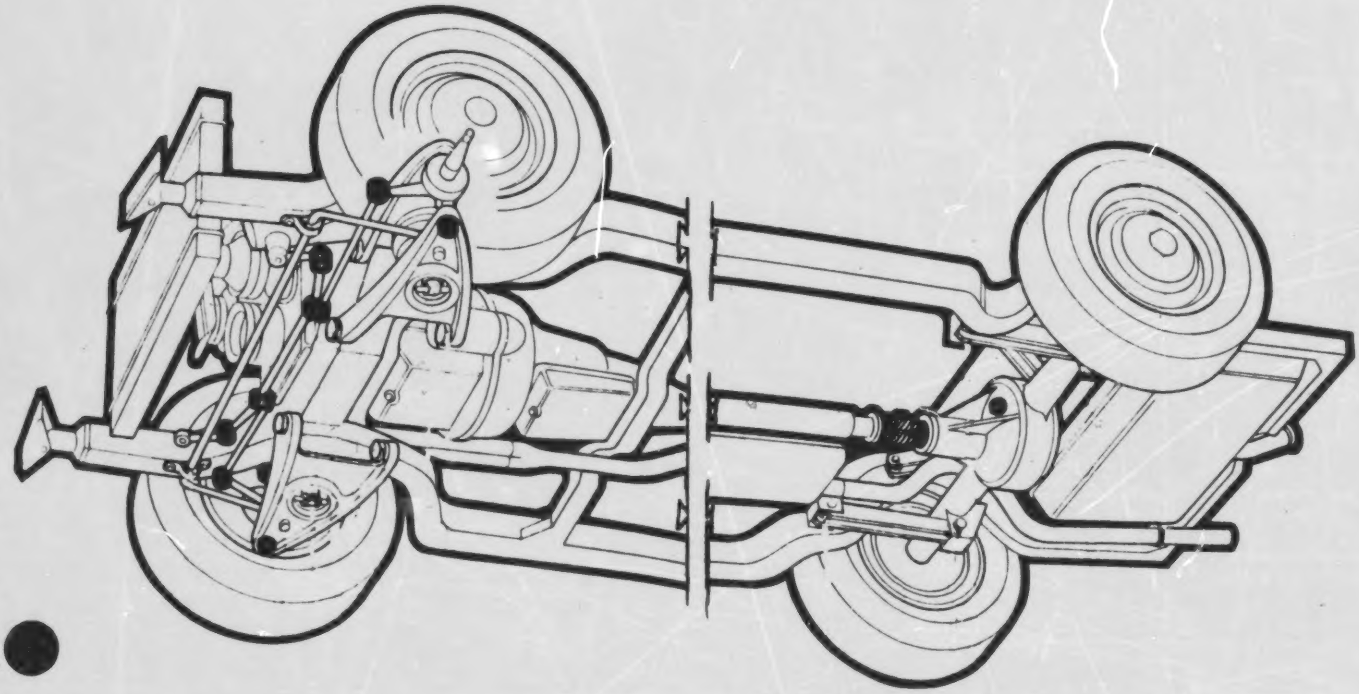


3. Set the parking brake. Place jack in position under the car. Jack up the car.



Set jack stands securely to support weight of the auto.

4. Using the auto manual or lubrication chart as a guide, locate and clean fittings and joints underneath the auto chassis.



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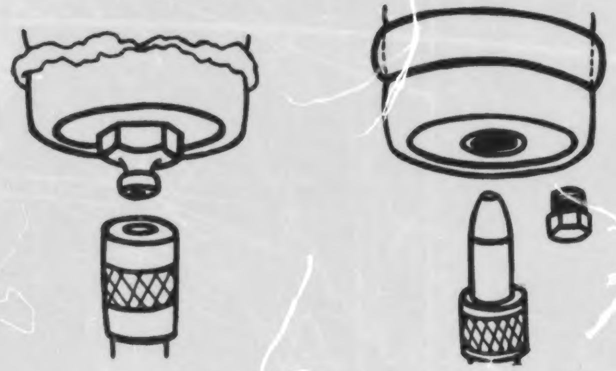
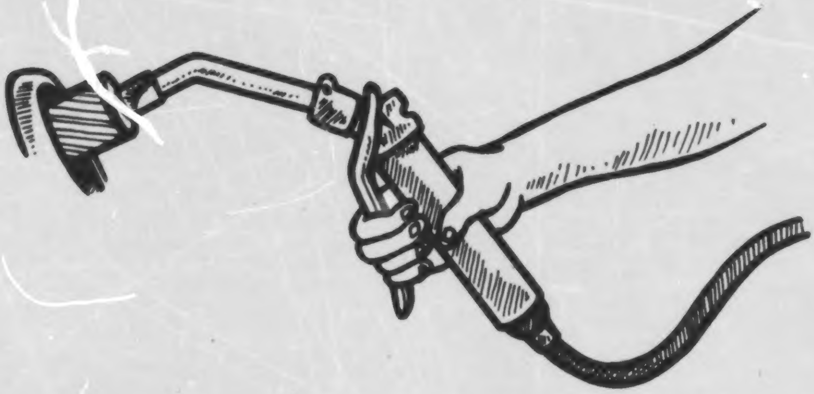
5. Check type of grease fittings on the car. Select and attach proper attachment to grease gun.

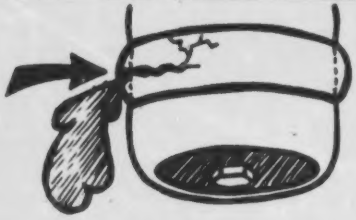


6. Place grease gun on each fitting, one shot only.

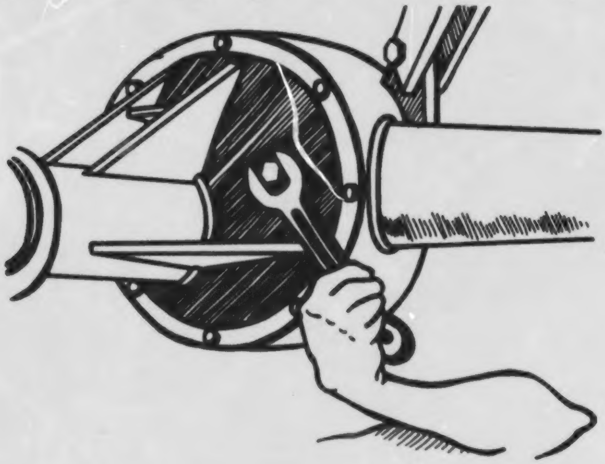


NOTE!

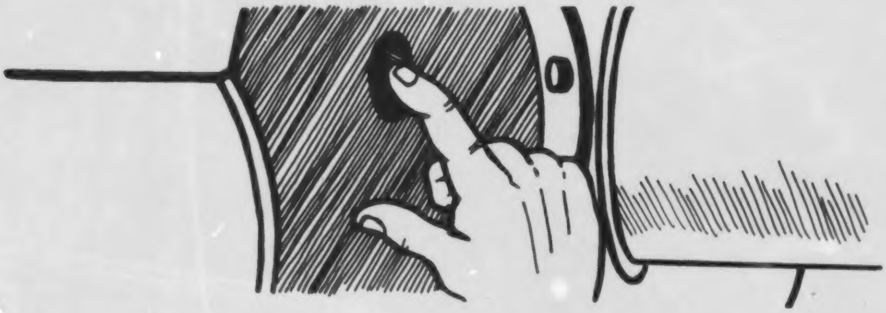
DO NOT force grease into fittings and burst the rubber boot.



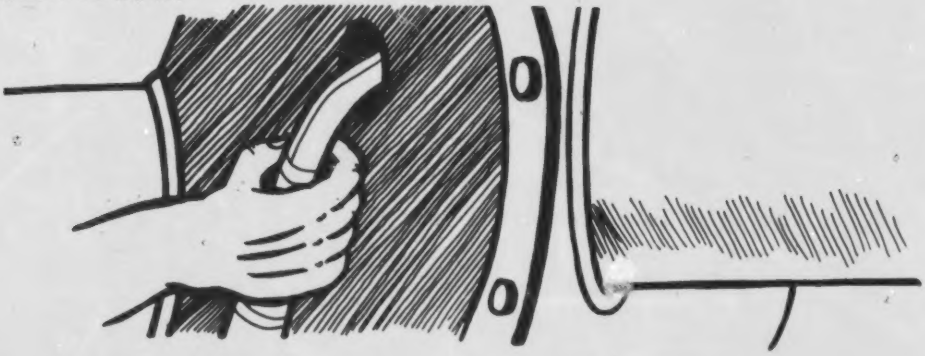
7. With the wrench, remove plug from rear-axle housing.



8. If lubricant begins to seep out, or you can touch it with your finger, level is correct. Replace plug and tighten it.



9. Add manufacturer's recommended gear lubricant if rear-axle lubricant is low.

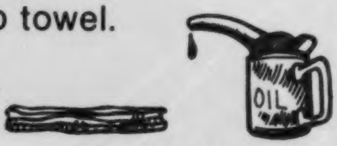


10. Replace rear-axle plug and tighten with a wrench.

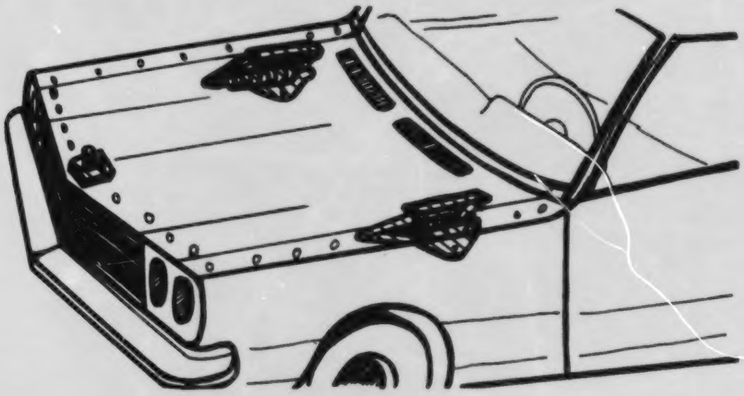
11. Remove the jack stands and lower car to floor.

C. Steps for Lubricating the Auto Body Parts.

12. Obtain small can of oil and a shop towel.



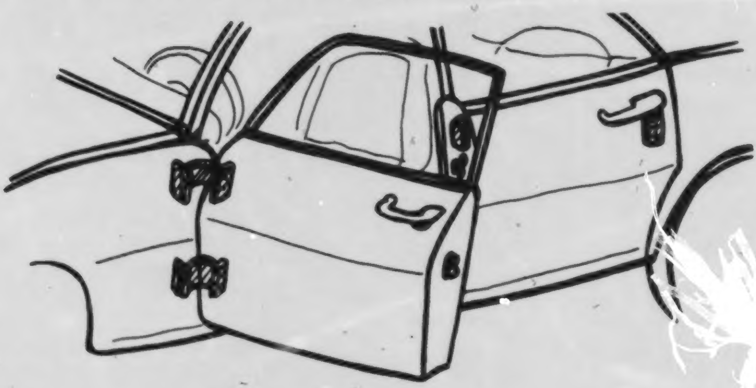
13. Lubricate the hood latch, hinges and hood release mechanism.



NOTE!

Wipe away excess oil when finished with each part.

14. Lubricate moving parts on the doors. This includes door hinges, door latch, door lock, and door stop.



15. Return tools to their proper places and clean up the work area.

SEE YOUR INSTRUCTOR

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Unit 5
Lubricating the Auto Chassis and Body

Practical Exercise Performance Checklist

The student ____________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified:			
a. Grease gun			
b. Grease			
c. Oil can			
2. Wore proper safety equipment.			
3. Set parking brake, jacked up car, properly positioned jack stands.			
4. Located and cleaned fittings and joints under auto chassis.			
5. Checked to determine type of grease fittings on car.			
6. Selected and attached proper attachment to grease gun.			
7. Correctly applied grease to each fitting.			
8. Removed plug from rear-axle housing.			
9. Checked the level of lubricant in housing.			
10. Added recommended lubricant if necessary.			
11. Replaced and tightened rear-axle plug.			
12. Removed jack stands and lowered car.			
13. Obtained shop towels and oil can.			
14. Lubricated hood latch, hinges and release mechanism.			

Tasks	Yes	No	Comments
15. Lubricated movable parts of the doors.			
16. Returned tools to their proper places and cleaned work area.			

Satisfactory Performance ☐
Repeat Exercise ☐
Should Move On ☐

Instructor's Signature

Date

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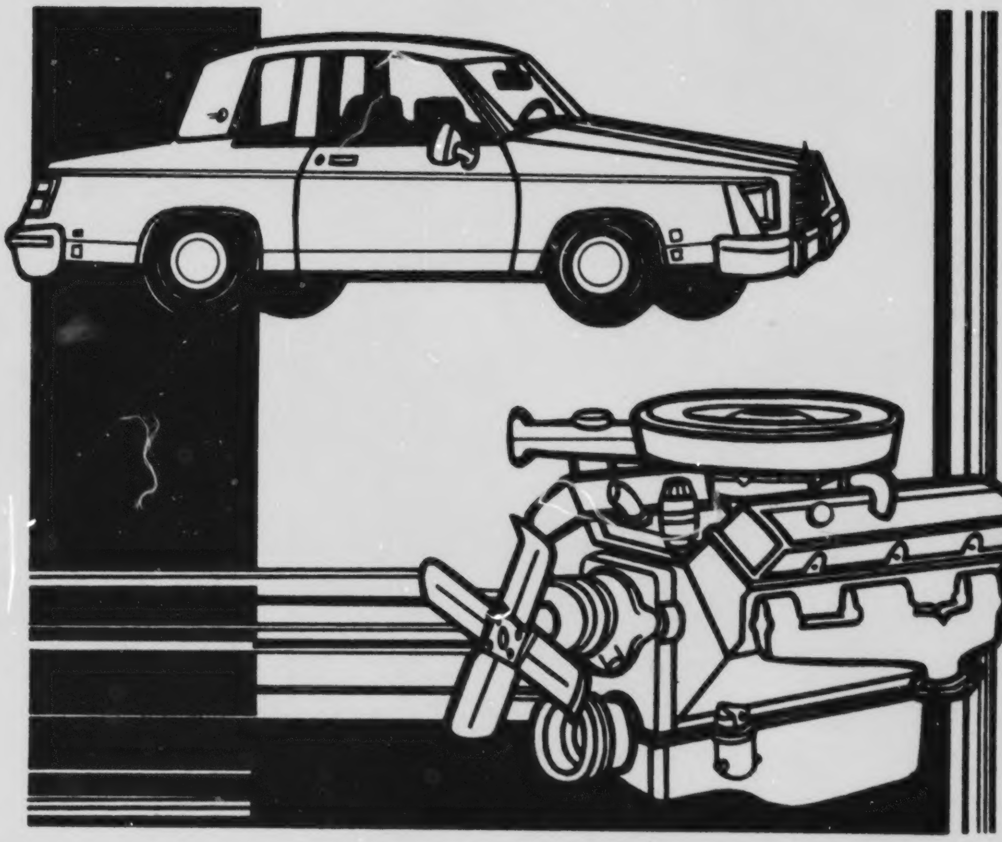
Vocational Preparation Curriculum
AUTO SERVICE



Unit 6

Checking the Automatic Transmission Fluid

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL TECHNICAL
EDUCATION
iml
INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

Unit 6

Checking the Automatic Transmission Fluid

Checking the Automatic Transmission Fluid

After you study this lesson, you should be able to:

1. Identify tools and materials used in checking the level of automatic transmission fluid.
2. Check the automatic transmission fluid.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ I can do all the tasks above and want my instructor to give me the Practical Exercise.

SEE YOUR INSTRUCTOR

2. ☐ I want to study the information in this unit before I do the Practical Exercise.

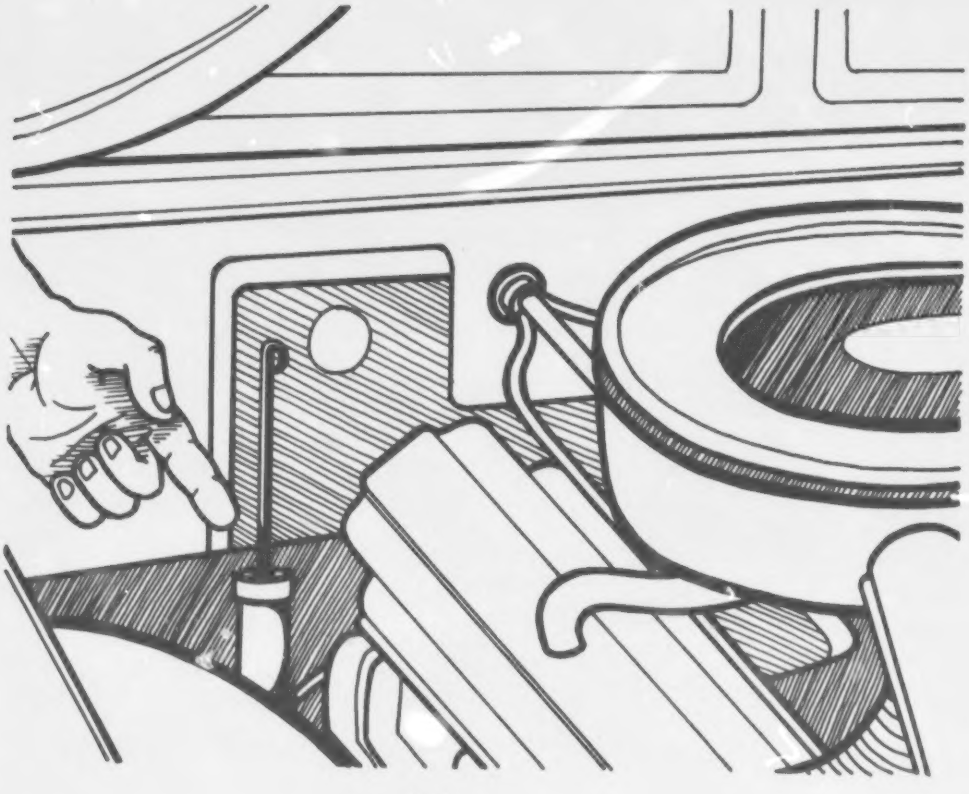
TURN THE PAGE AND BEGIN

Unit 6
Checking the Automatic Transmission Fluid

Introduction

Motor vehicles have either a manual or automatic transmission. Automatic transmission fluid is checked with a dipstick while the car is running.

In this lesson, you will learn to check the fluid level in an automatic transmission.



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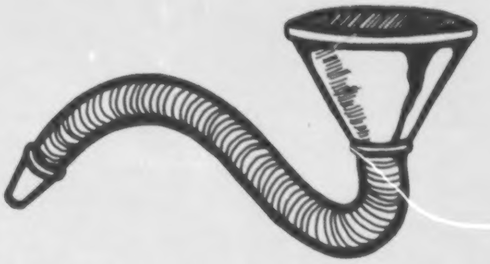
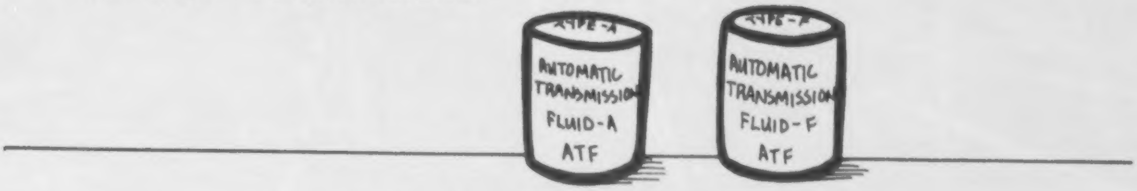
Unit 6
Checking the Automatic Transmission Fluid

A. Tools, Materials and Equipment for Checking the Automatic Transmission Fluid.

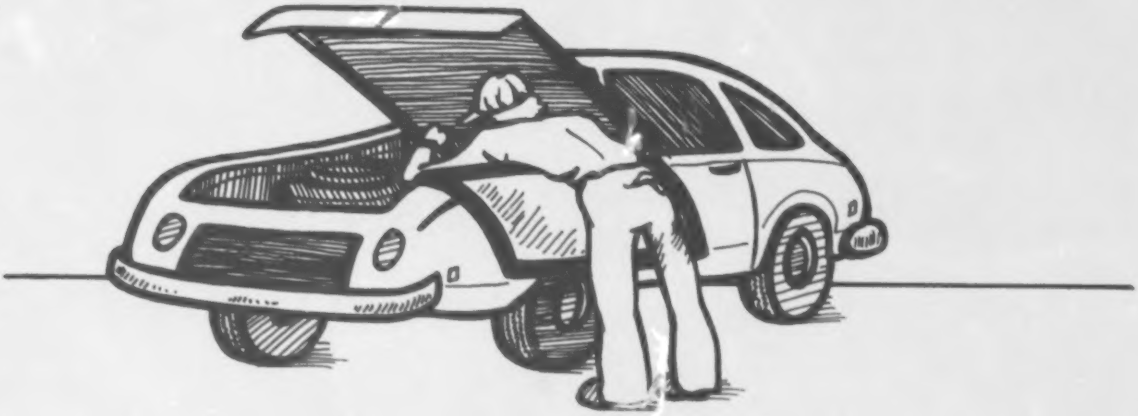
1. **FLEXIBLE NECKED FUNNEL:** Used to pour fluid into transmission.



2. **TRANSMISSION FLUID:** Lubricant or oil made for use in automatic transmissions.


TYPE-A
AUTOMATIC TRANSMISSION FLUID-A ATF
TYPE-F
AUTOMATIC TRANSMISSION FLUID-F ATF

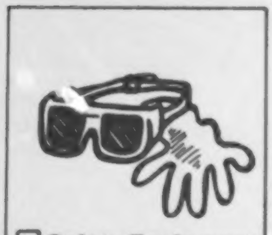
3. **FENDER COVER:** Rubber covering used to protect fender from dirt and scratches when engine work is done.



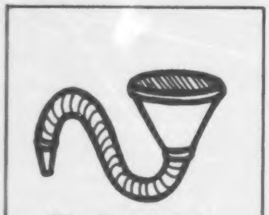
TURN TO NEXT PAGE

B. Steps for Checking the Automatic Transmission Fluid.

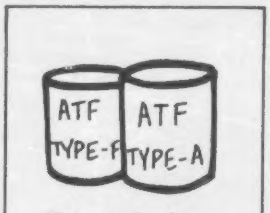
1. Find and Check Off the following:



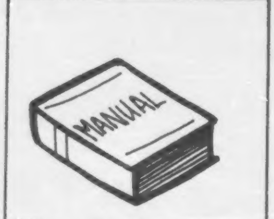
☐ **Safety Equipment**



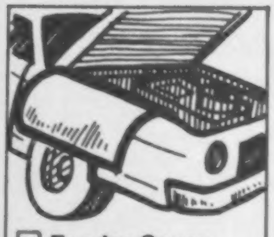
☐ **Flexible Neck Funnel**



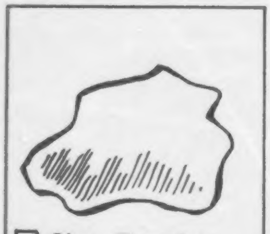
☐ **Transmission Fluid**



☐ **Service Manaul**

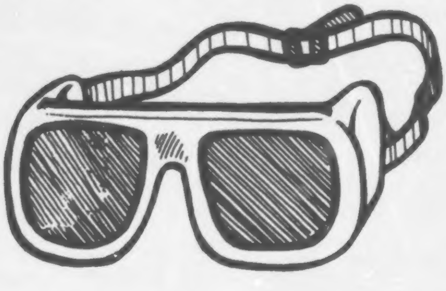


☐ **Fender Cover**



☐ **Shop Towel**

2. Wear proper safety equipment.

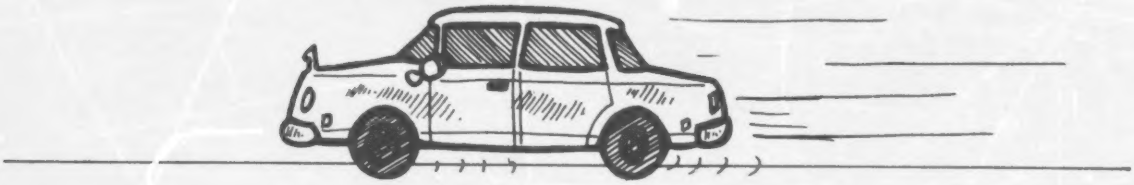


3. Check Auto Service Manual for recommended transmission fluid in car you will be checking.

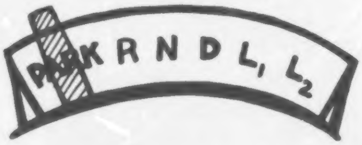
NOTE!

Transmission fluid must be checked when it is hot. This is because fluid expands when it is heated.

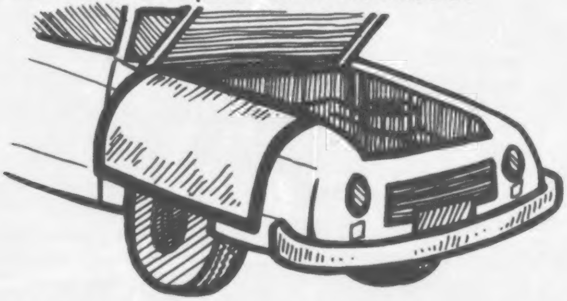
4. Drive car for several minutes to warm the transmission fluid.



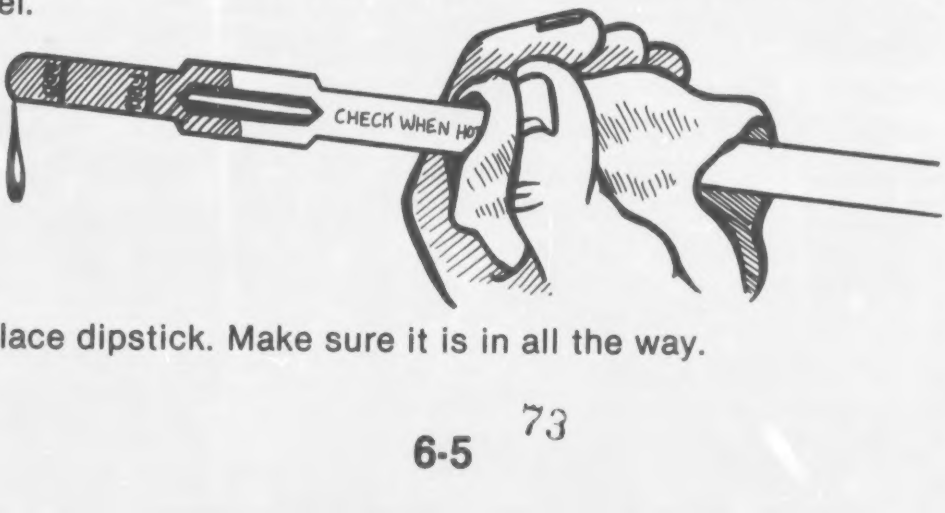
5. Place the transmission in park, put on emergency brake and let car idle.


PARK R N D L_1 L_2

6. Open the hood and place fender cover over the side where transmission fluid dipstick is located.

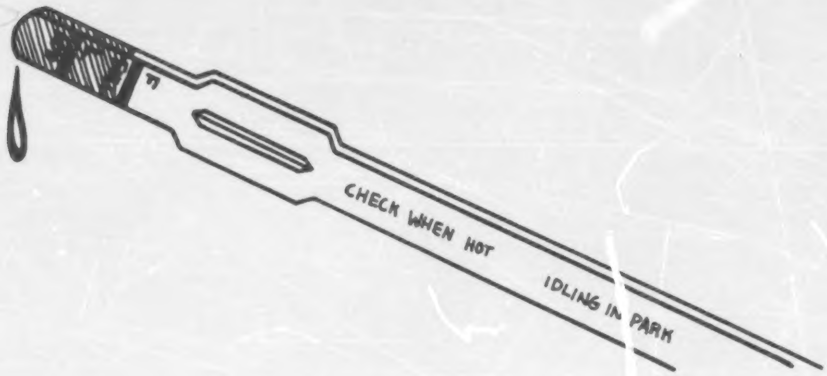


7. Remove transmission fluid dipstick. Wipe it clean with a shop towel.



Replace dipstick. Make sure it is in all the way.

8. Remove dipstick again and check fluid level.


CHECK WHEN HOT
IDLING IN PARK

NOTE!

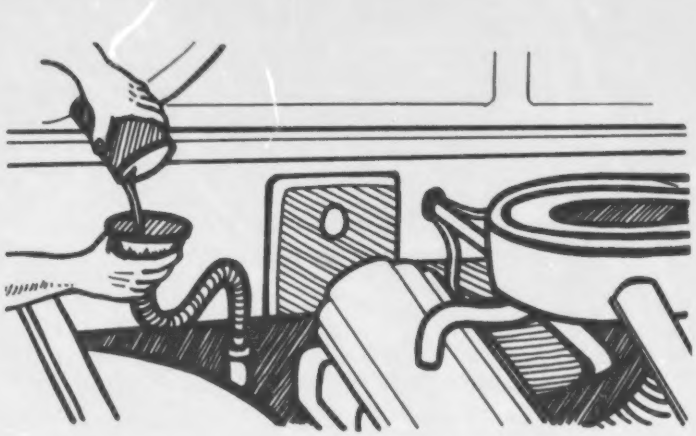
Fluid level should be above 'L' or Low and below 'F' or Full to have correct fluid level. Look at the color of the fluid:

A reddish color shows fluid is good.

9. If transmission fluid level is at or below 'L' or Low, add fluid to raise the level to 'F' or Full. Use only fluid recommended in the Service Manual.

TRANSMISSION FLUIDS

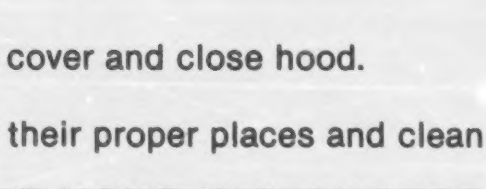
10. Place the flexible funnel spout into the transmission fluid opening. Pour fluid carefully into the funnel.



NOTE!

Pour a small amount at a time and check the level each time. Do Not Overfill.

11. Check fluid level once again. Shut off engine.



12. Remove fender cover and close hood.

13. Return tools to their proper places and clean work area.

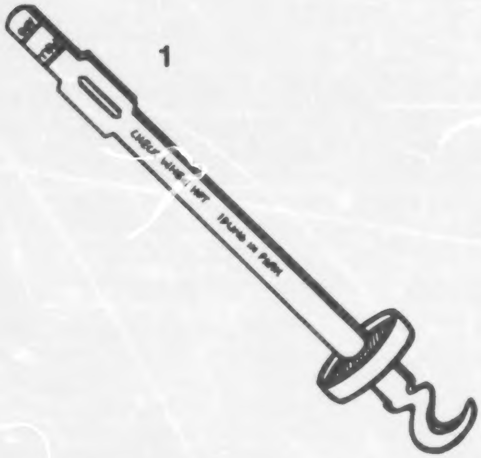
SEE YOUR INSTRUCTOR

Unit 6
Checking the Automatic Transmission Fluid

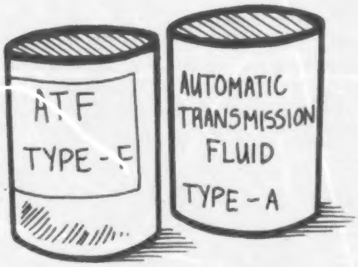
Tools and Materials Identification Exercise

Match the words with the correct objects.

_____ A. Flexible necked funnel
_____ B. Transmission fluid
_____ C. Fender Cover
_____ D. Transmission fluid dipstick

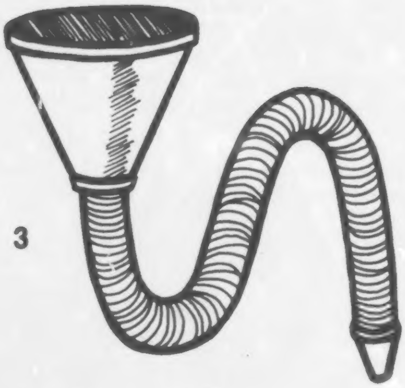


1



ATF
TYPE - F
AUTOMATIC TRANSMISSION FLUID
TYPE - A

2



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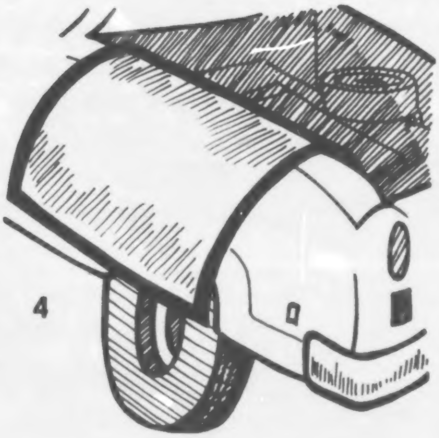

4

Unit 6
Checking the Automatic Transmission Fluid

Practical Exercise Performance Checklist

The student ______________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified:			
a. Flexible-necked funnel			
b. Transmission fluid			
c. Fender cover			
2. Wore proper safety equipment.			
3. Checked the service manual for recommended transmission fluid.			
4. Warmed up transmission fluid.			
5. Placed transmission in park, put on emergency brake and let car idle.			
6. Opened hood and placed fender cover over the side where transmission fluid dipstick is located.			
7. Removed dipstick, wiped it clean and replaced it.			
8. Removed dipstick again and checked fluid level on it.			
9. Placed flexible funnel spout into transmission fluid opening and carefully poured fluid into funnel.			
10. Checked the fluid level. Shut off engine.			
11. Removed fender cover and closed hood.			
12. Returned tools to their proper places and cleaned work area.			

Satisfactory Performance ☐
Should Move On ☐
Repeat Exercise ☐

______________________ Instructor's Signature
__________ Date

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Vocational Preparation Curriculum
AUTO SERVICE

Unit 7

Checking and Replacing a Fan Belt

Developed By: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION

INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

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Unit 7
Checking and Replacing a Fan Belt

Checking and Replacing a Fan Belt

After you study this lesson, you should be able to:

1. Check a fan belt.
2. Replace a fan belt.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

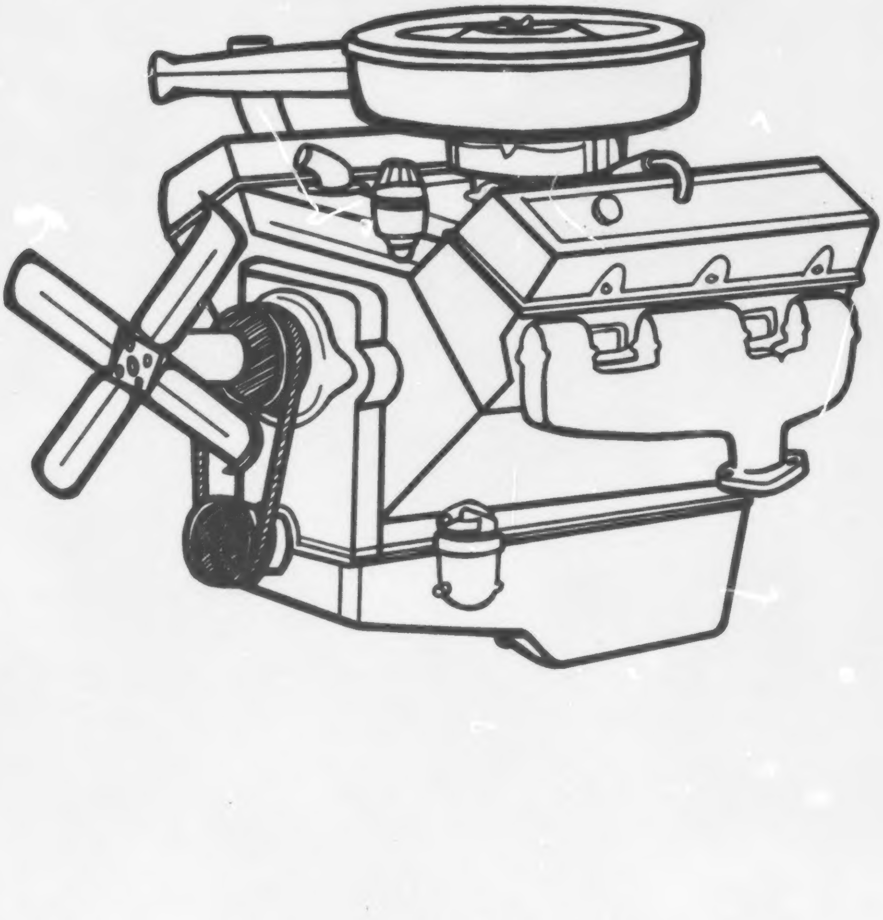
TURN THE PAGE AND BEGIN

Unit 7
Checking and Replacing a Fan Belt

Introduction

Automobile engines are either air-cooled or water-cooled. Both types have fans to help cool the engine when idling.

The fan belt must be checked to make sure it is in good condition. In this lesson, you will learn how to check and replace a worn fan belt.

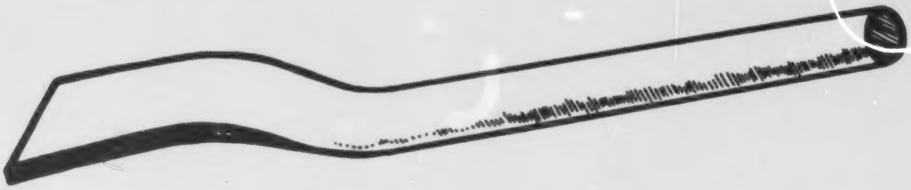


TURN TO NEXT PAGE

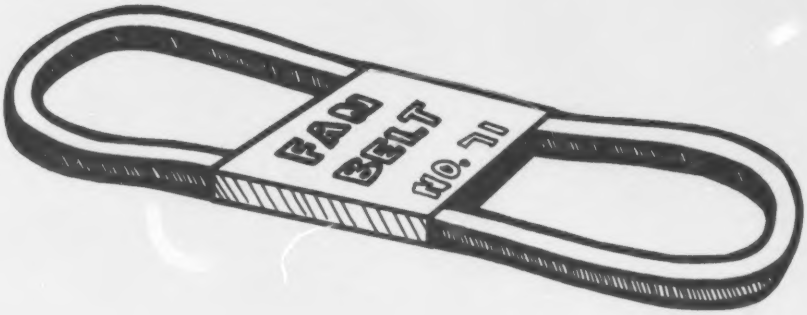
Unit 7
Checking and Replacing a Fan Belt

A. Tools, Materials and Equipment for Checking and Replacing a Fan Belt.

1. **PRY BAR:** Used to apply pressure to alternator when loosening or tightening a fan belt.



2. **FAN BELT:** Same size belt used to replace old fan belt.



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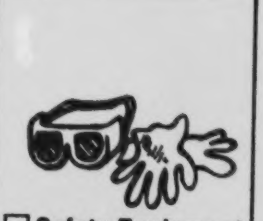
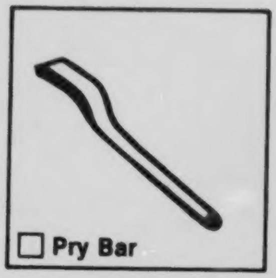
B. Steps for Checking and Replacing a Fan Belt.

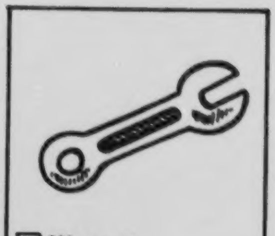
1. Find and Check Off the following:



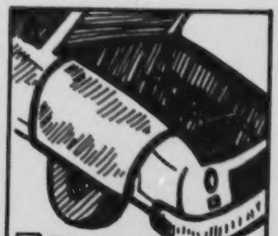
☐ **Safety Equipment**



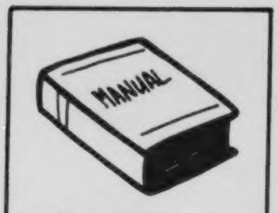
☐ **Pry Bar**



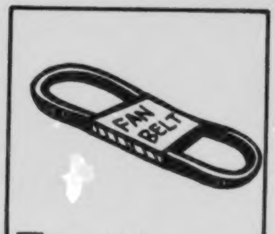
☐ **Wrench**



☐ **Fender Cover**

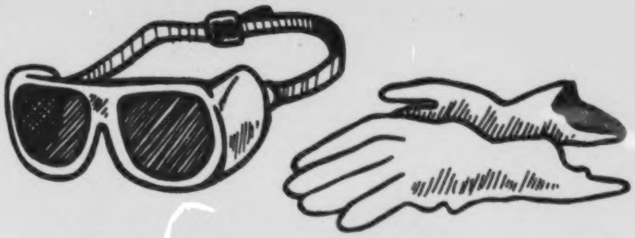


☐ **Auto Service Manual**

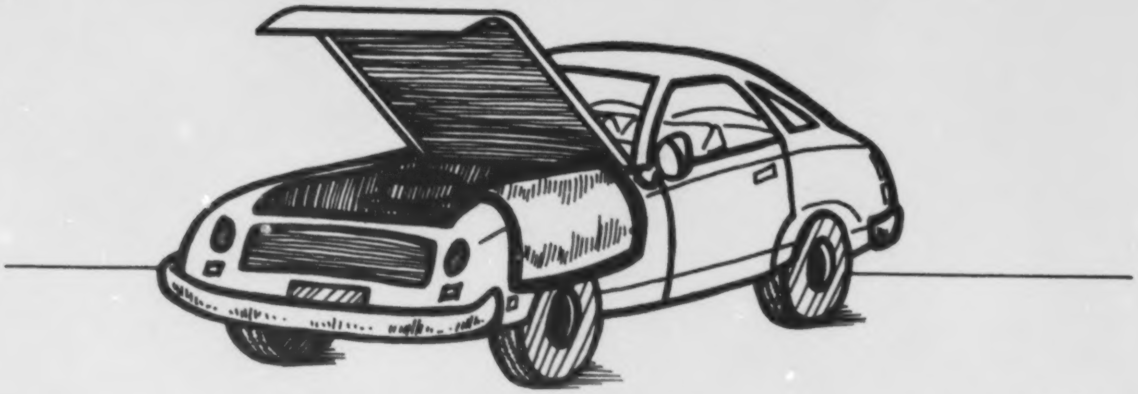


☐ **Fan Belt**

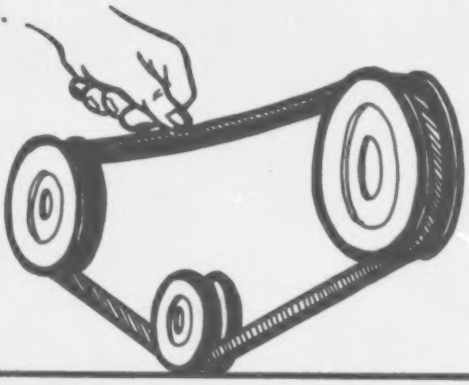
2. Wear proper safety equipment.



3. Open car hood and spread fender cover over the front fender.



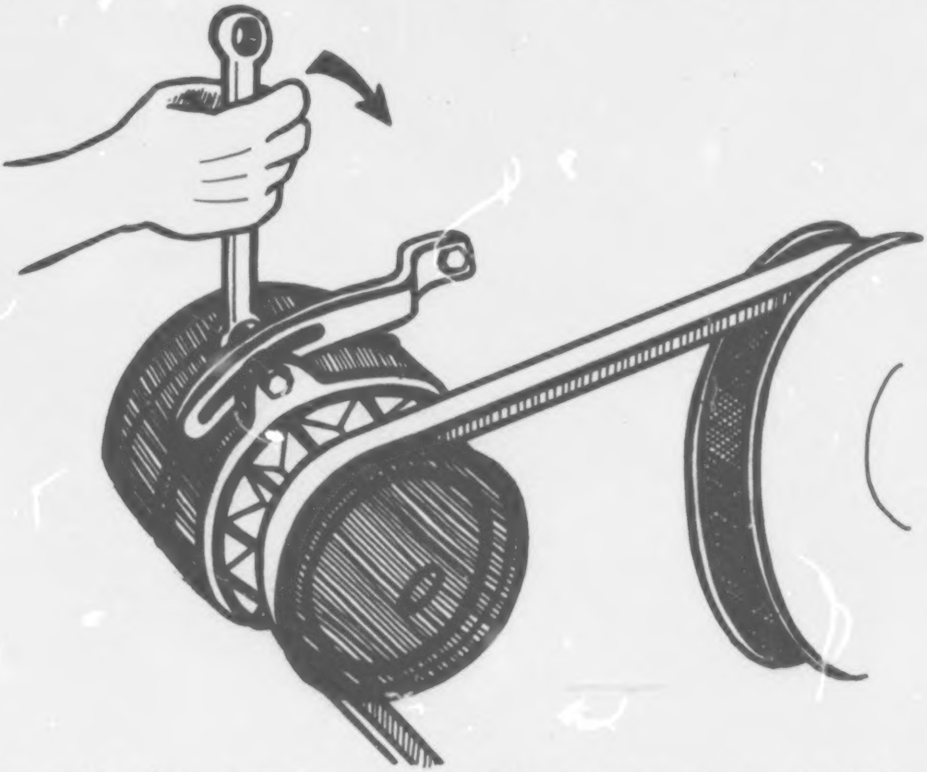
4. Locate fan belt with your teacher's assistance. Check for tightness or looseness by pressing down midway between the pulleys or metal wheels.



NOTE!

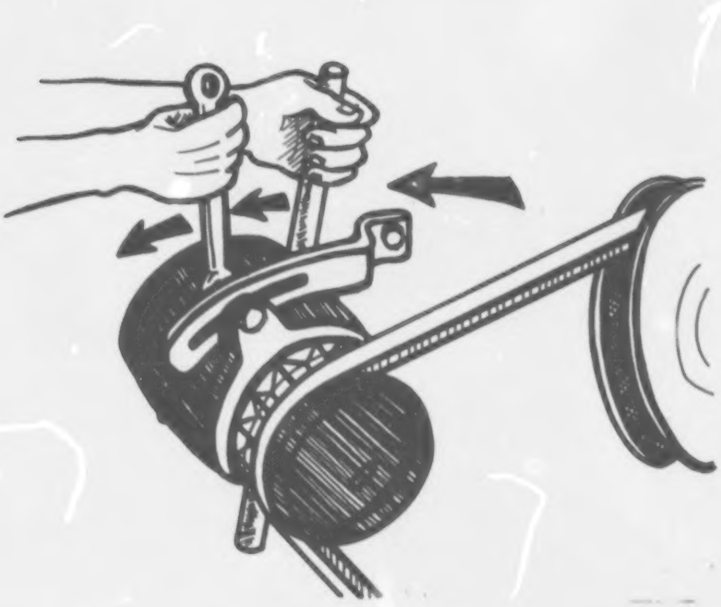
If belt goes in more than 1/2 inch when depressed, it needs to be tightened.

5. To tighten fan belt, locate alternator. Loosen alternator by turning and adjusting arm bolt two complete turns to the left.



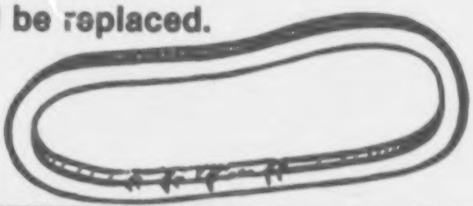
You may also have to loosen the bolt that holds alternator to the engine.

6. Use pry bar to force alternator away from fan pulley until fan belt is tight. Tighten arm bolt with wrench.

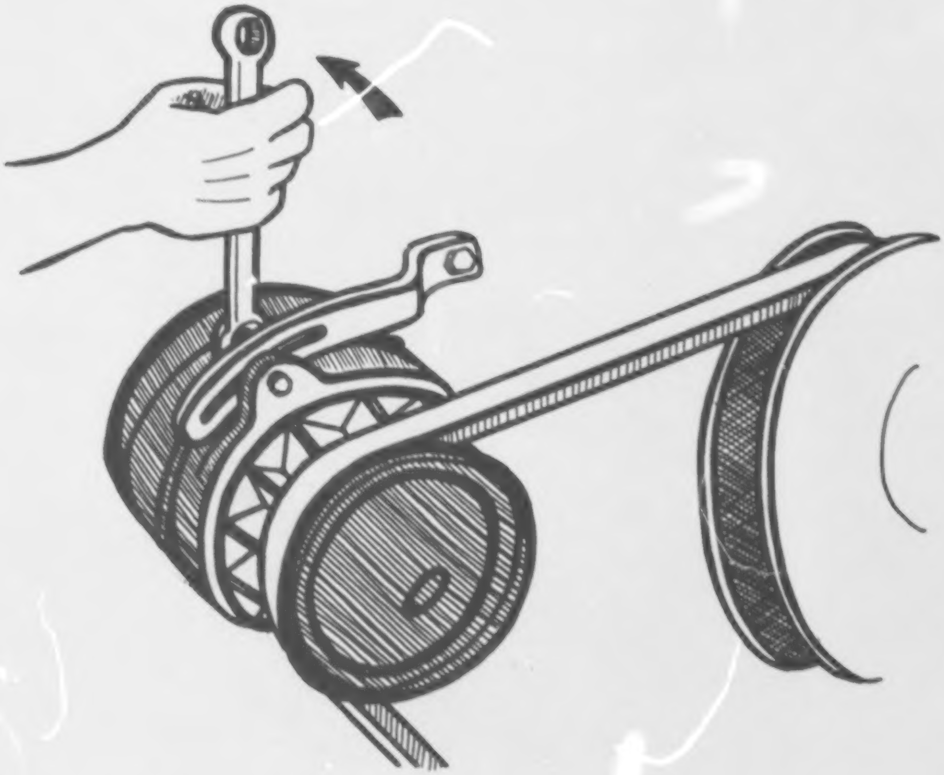


NOTE!

If fan belt is cracked, it should be replaced.



7. To replace fan belt, loosen alternator by turning arm bolt two complete turns to the left.

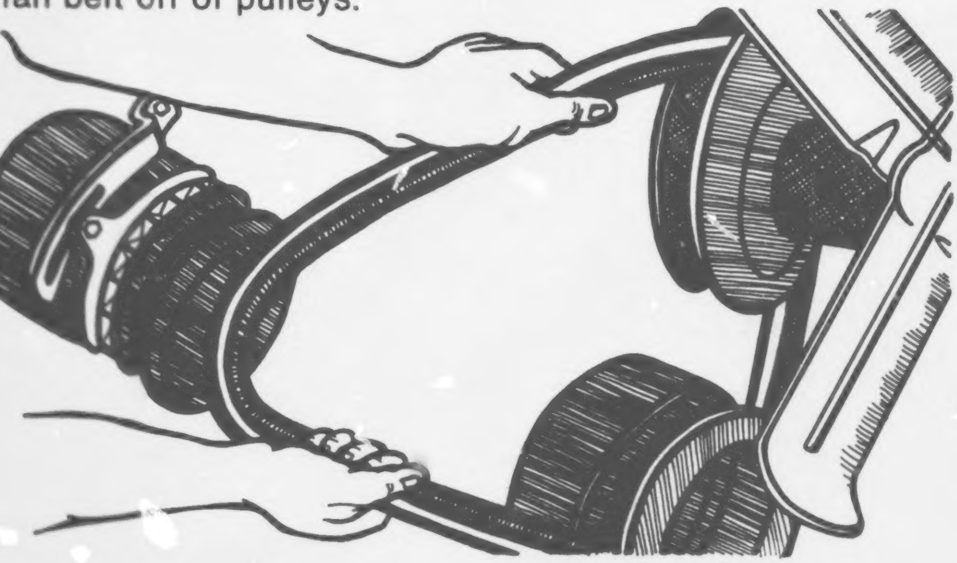


You may have to loosen bolt holding alternator to engine.

NOTE!

Do not lever pry bar against the pulley, but against engine part instead. The engine part is strong enough to absorb pressure.

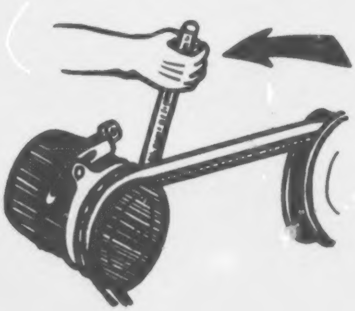
8. Slip fan belt off of pulleys.



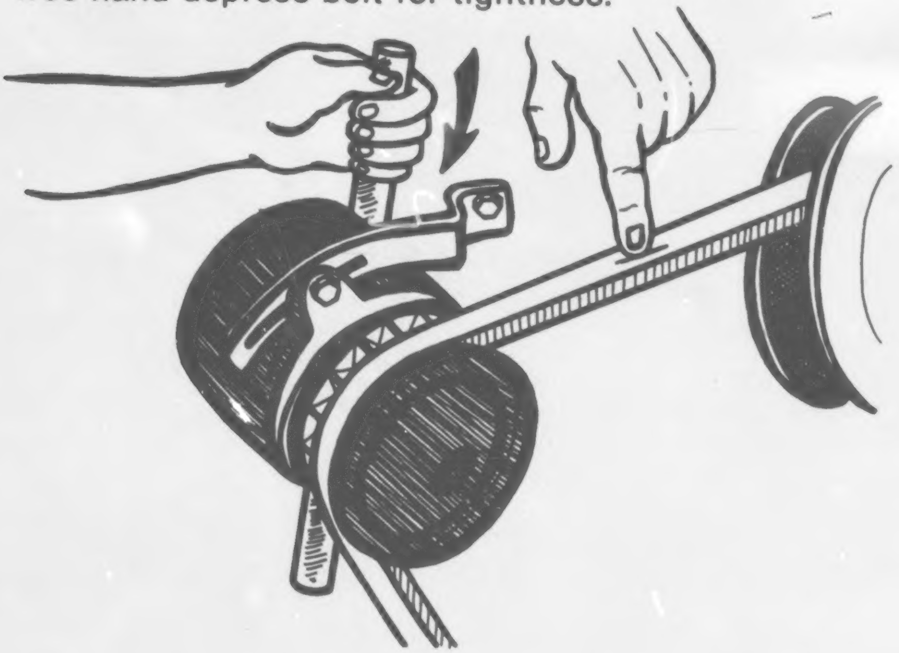
9. Use service manual to determine correct replacement fan belt to use.

10. Obtain proper fan belt. Loop it back over pulleys in the same manner you took off worn fan belt.

11. Insert pry bar between engine block and alternator. Apply pressure to force alternator away from fan pulley until belt is tight.



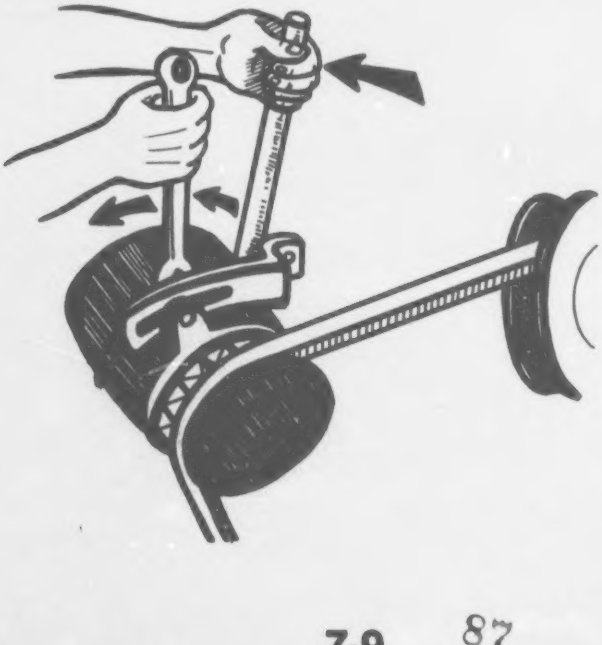
12. Hold alternator in a tight position with one hand. With your free hand depress belt for tightness.



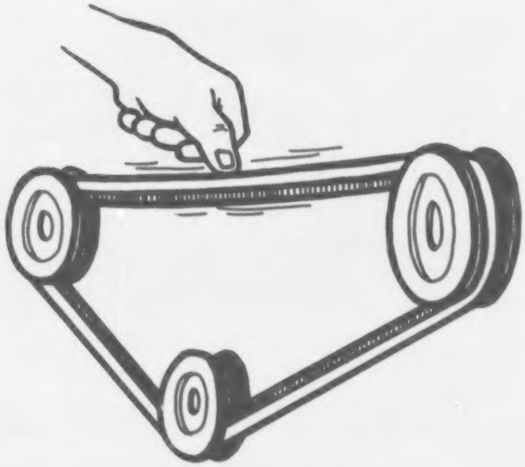
NOTE!

The belt should not depress more than 1/2 inch.

13. Tighten adjusting-arm bolt while holding alternator in tight position away from fan.



14. Check tightness of belt again to make sure it is still correct.



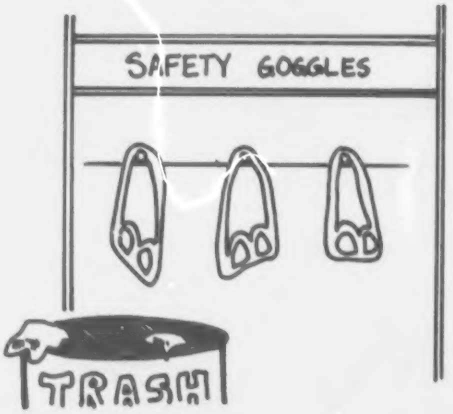
NOTE!

Belt should depress about 1/2 inch.

15. Repeat the procedure if belt is not tight enough.

16. Remove fender cover and close engine hood.

17. Return tools to their proper places and clean your work area.



SEE YOUR INSTRUCTOR

Unit 7
Checking and Replacing a Fan Belt

Practical Exercise Performance Checklist

The Student ______________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified:			
a. Pry bar			
b. Fan belt			
2. Wore proper safety equipment.			
3. Opened hood and spread fender cover over front fender.			
4. Checked tightness of belt.			
5. Tightened fan belt by loosening alternator and forcing it away from fan pulley.			
6. Properly loosened alternator to replace fan belt.			
7. Correctly forced alternator housing toward fan pulley until fan belt loosened.			
8. Slipped belt off from pulleys.			
9. Referred to service manual for correct replacement of fan belt.			
10. Obtained and correctly looped new fan belt over the pulleys.			
11. Forced alternator away from fan pulley.			
12. Checked belt tightness.			
13. Tightened adjusting-arm bolt.			
14. Rechecked tightness of belt.			

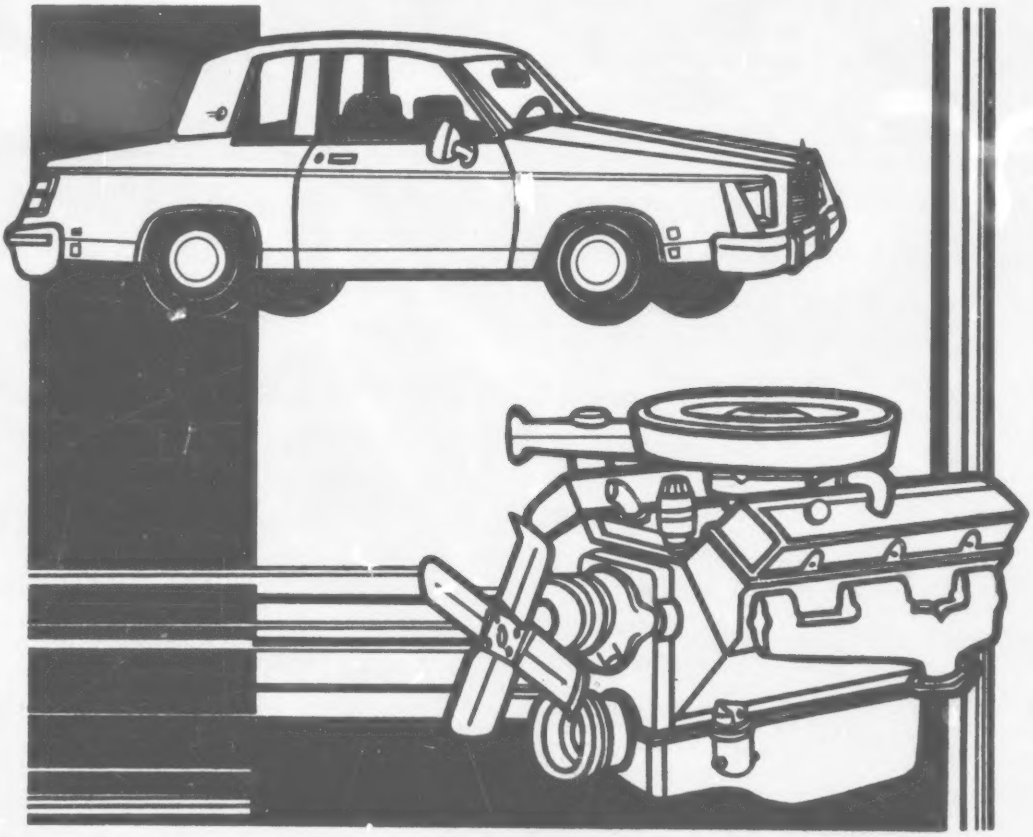
Tasks	Yes	No	Comments
15. Removed fender cover and closed engine hood.			
16. Returned tools to their proper places and cleaned work area.			

Satisfactory Performance ☐
Should Move On ☐
Repeat Exercise ☐

Instructor's Signature

Date

Vocational Preparation Curriculum
AUTO SERVICE



Unit 8

Checking, Recharging and Cleaning a Battery

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION
iml
INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

Unit 8
Checking, Recharging and Cleaning a Battery

Checking, Recharging and Cleaning a Battery

After you study this lesson, you should be able to:

2. Identify tools, materials and equipment used to check, recharge and clean a car battery.

2. Check a car battery.

3. Recharge a weak car battery.

4. Clean a car battery.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

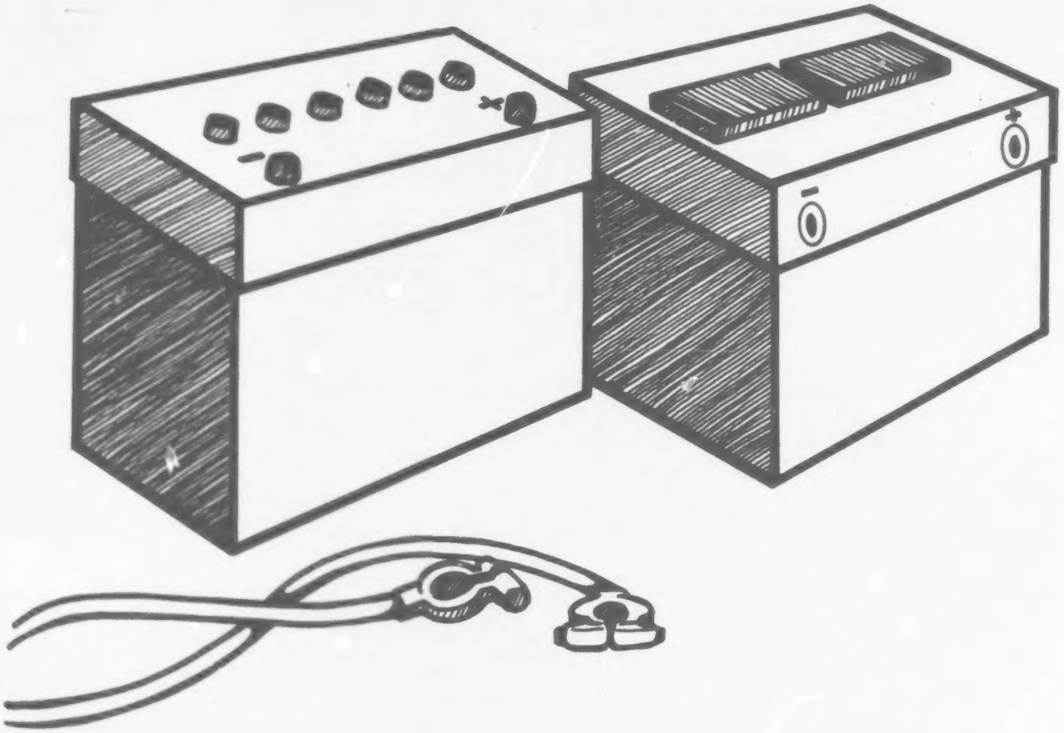
TURN THE PAGE AND BEGIN

Unit 8
Checking, Recharging and Cleaning a Battery

Introduction

A battery supplies the electrical power to start a car engine. It also provides power for the headlights, radio, turn signals, and brake lights. The car battery is very important and therefore, should always be checked and kept in good working condition.

In this unit you will learn how to check, recharge and clean a battery.

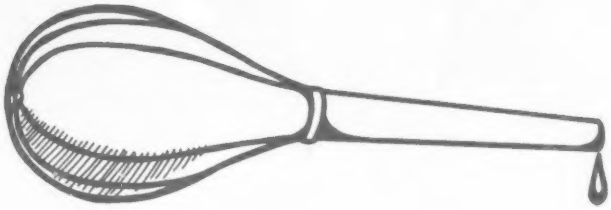


TURN TO NEXT PAGE

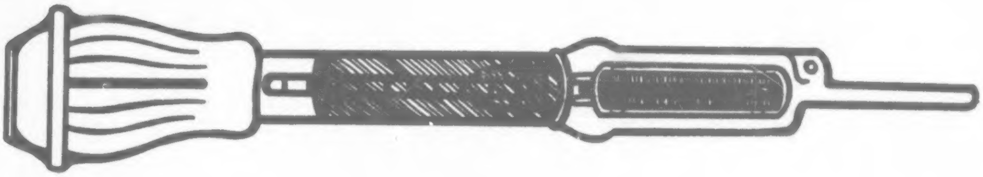
Unit 8
Checking, Recharging and Cleaning a Battery

A. Tools, Materials and Equipment for Checking, Recharging and Cleaning a Battery.

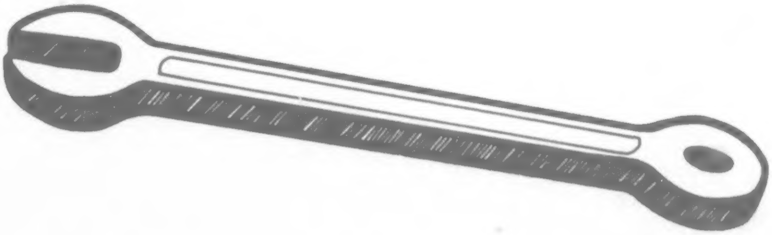
1. **BATTERY SYRINGE:** Used to add water or electrolyte to a battery.



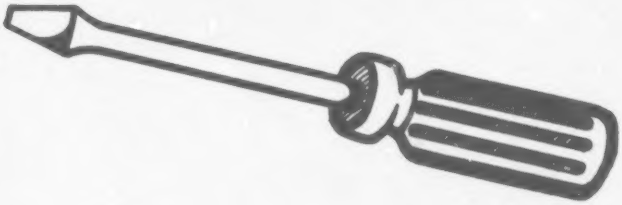
2. **HYDROMETER:** Used to check liquid or electrolyte in a battery.



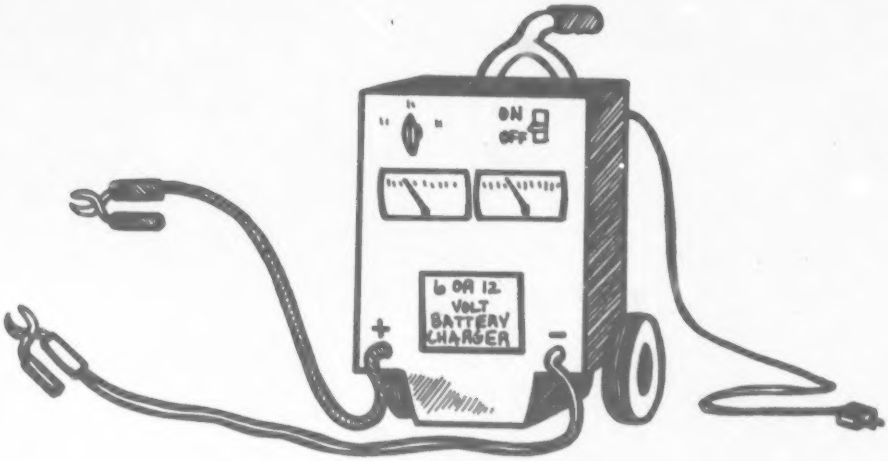
3. **COMBINATION WRENCH:** Used to loosen or tighten battery cables.



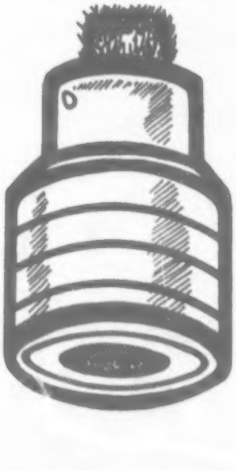
4. **STANDARD SCREWDRIVER:** Used for loosening or tightening a battery cable.



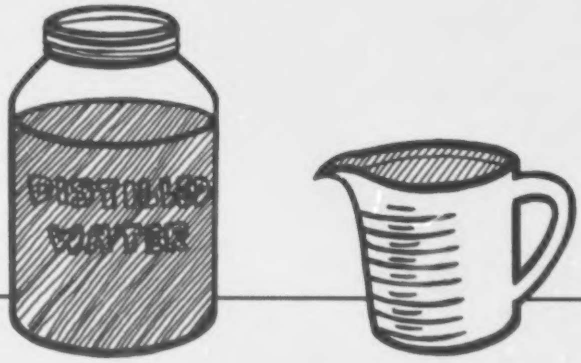
5. **BATTERY CHARGER:** Device used to restore electrical strength to a battery.


ON
OFF
6 OR 12 VOLT BATTERY CHARGER
+
−

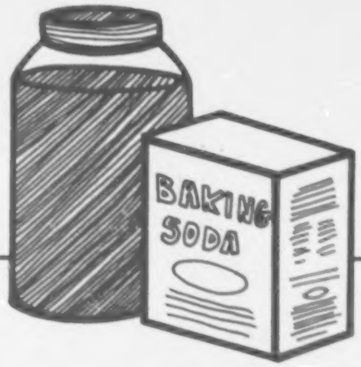
6. **CABLE CLAMP CLEANER:** Used to clean the inside circle of the cable clamp.



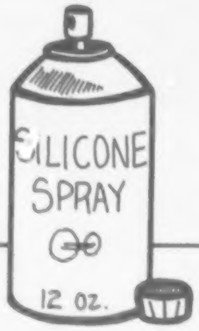
7. **DISTILLED WATER:** Added to a battery when liquid is low.


DISTILLED
WATER

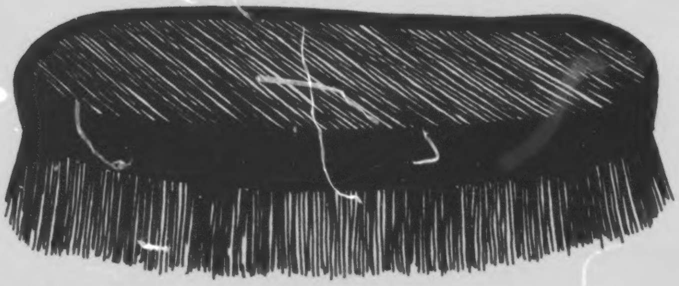
8. **BAKING SODA/WATER SOLUTION:** Two tablespoons of baking soda and one pint of water used to wash electolyte and corrosion from a battery.


BAKING
SODA

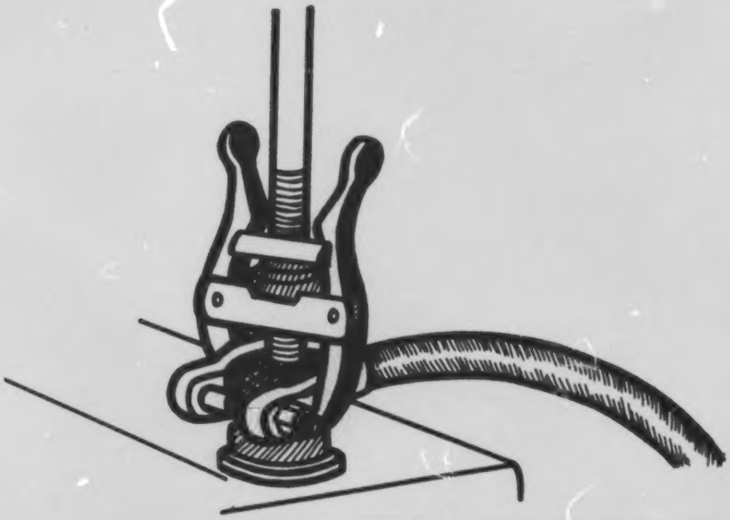
9. **SILICONE SPRAY:** Used to coat the battery post.


SILICONE
SPRAY
12 oz.

10. **BRISTLE BRUSH:** Used to clean dirt from the battery.



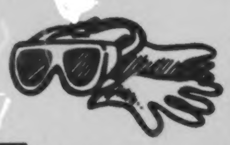
11. **BATTERY CLAMP PULLER:** Used to remove the battery cable clamp from the battery post.



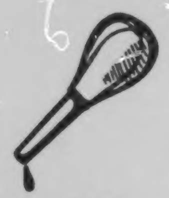
TURN TO NEXT PAGE

B. Steps for Checking a Car Battery.

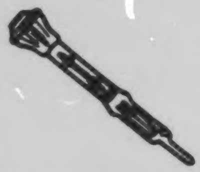
1. Find and Check Off the following:



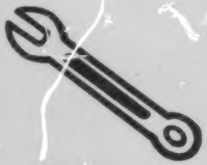
☐ Safety Equipment



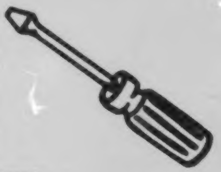
☐ Battery Syringe



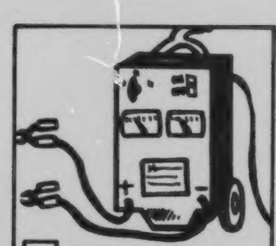
☐ Hydrometer



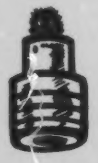
☐ Combination Wrench



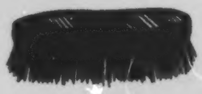
☐ Screwdriver



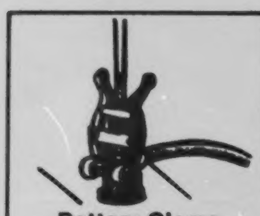
☐ Battery Charger



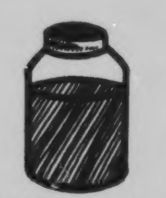
☐ Cable Clamp Cleaner



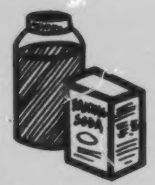
☐ Bristle Brush



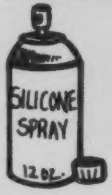
☐ Battery Clamp Puller



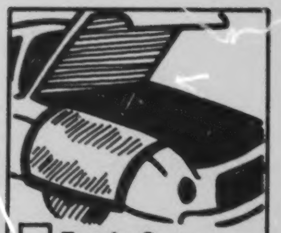
☐ Distilled Water



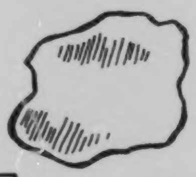
☐ Baking Soda Solution



☐ Silicone Spray

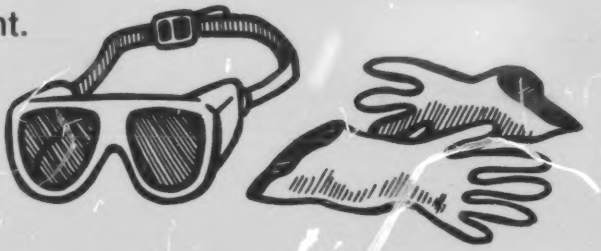


☐ FenderCover

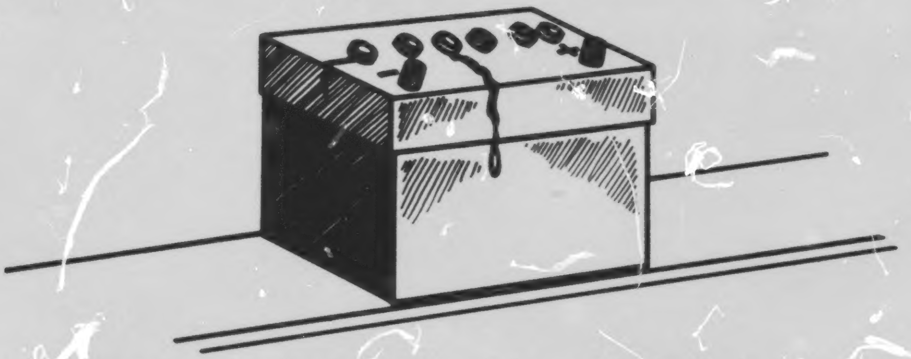


☐ Shop Towels

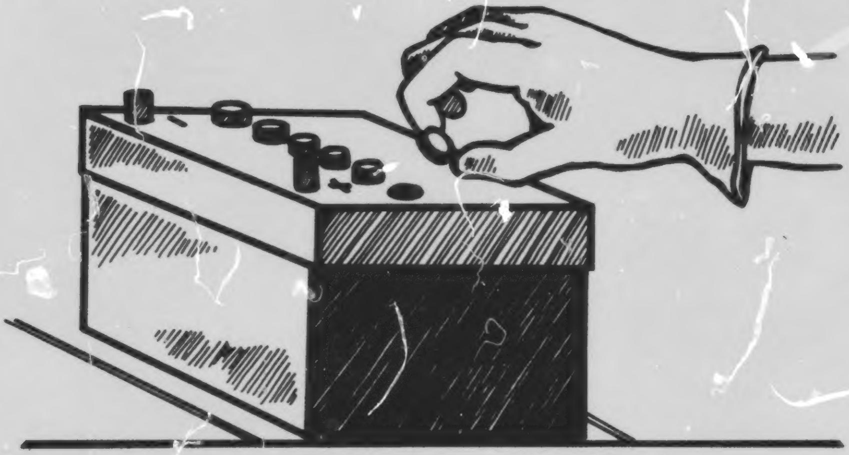
2. Wear proper safety equipment.



3. Open the car hood. Locate the battery and check it for cracks or leaks.



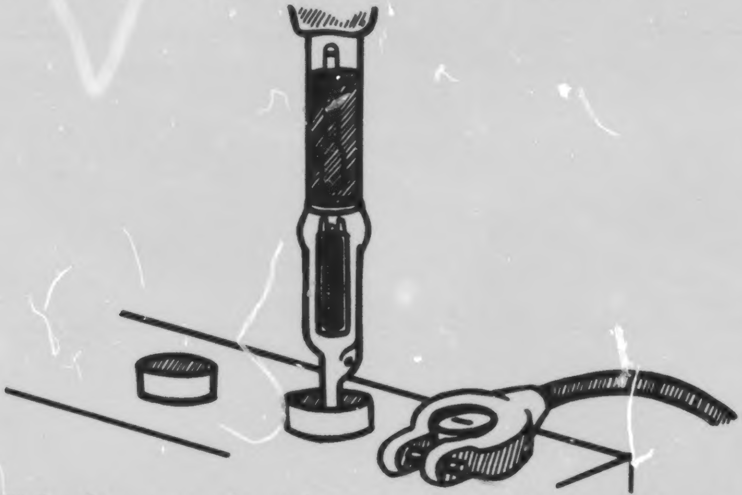
4. Unscrew or unplug vent caps from the battery top and place them on the battery case.



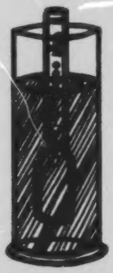
CAUTION!

Never smoke or light a match while removing vent caps. Battery gasses may explode.

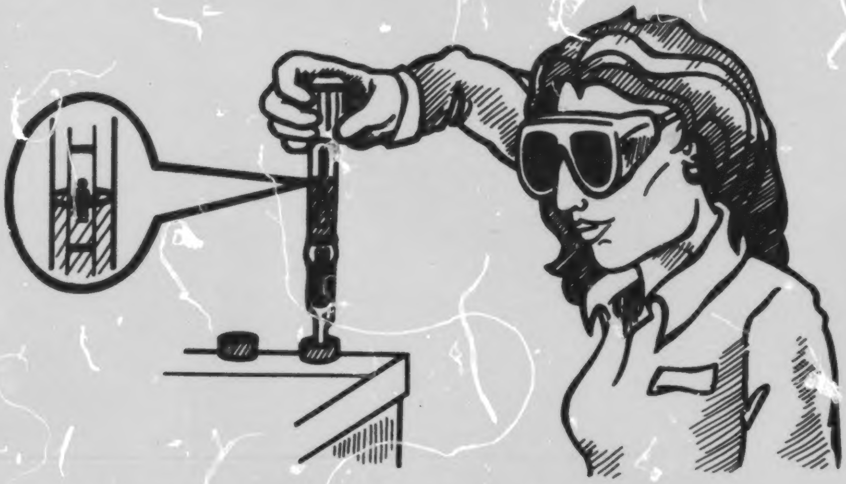
5. Insert hydrometer into one cell. Squeeze the rubber bulb and slowly release it to draw electrolyte from battery into hydrometer.



6. Continue to fill hydrometer in this manner until the float is suspended freely in the electrolyte.



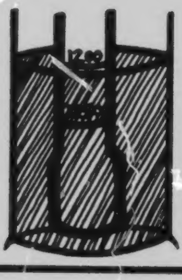
7. Hold hydrometer straight with the nozzle still in the cell.



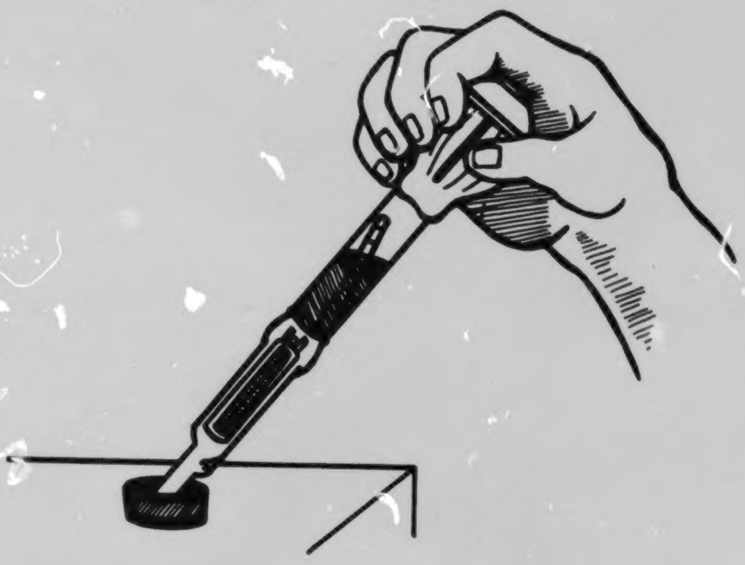
Read the level of electrolyte. Write down the reading for that cell.

NOTE!

Numbers on the float show the condition of the battery. The number in line with the liquid surface is the number you write down.

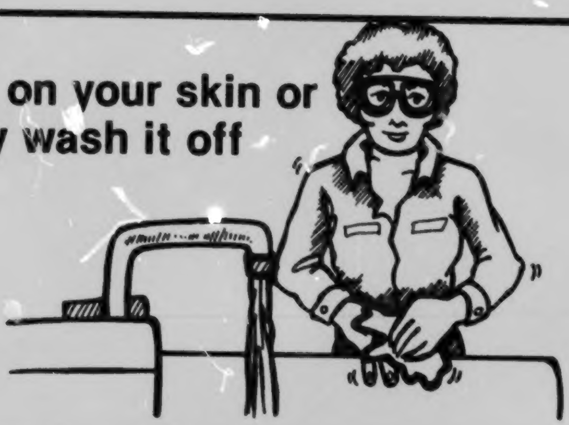


8. Squeeze the electrolyte back into the cell.

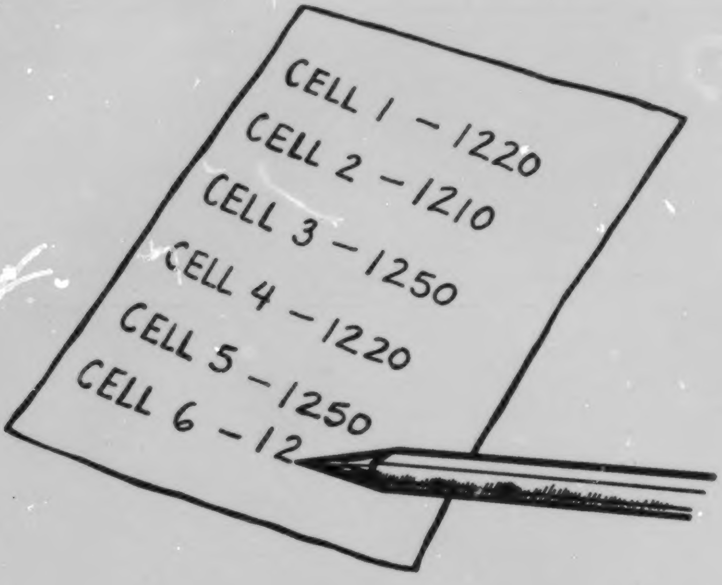


CAUTION!

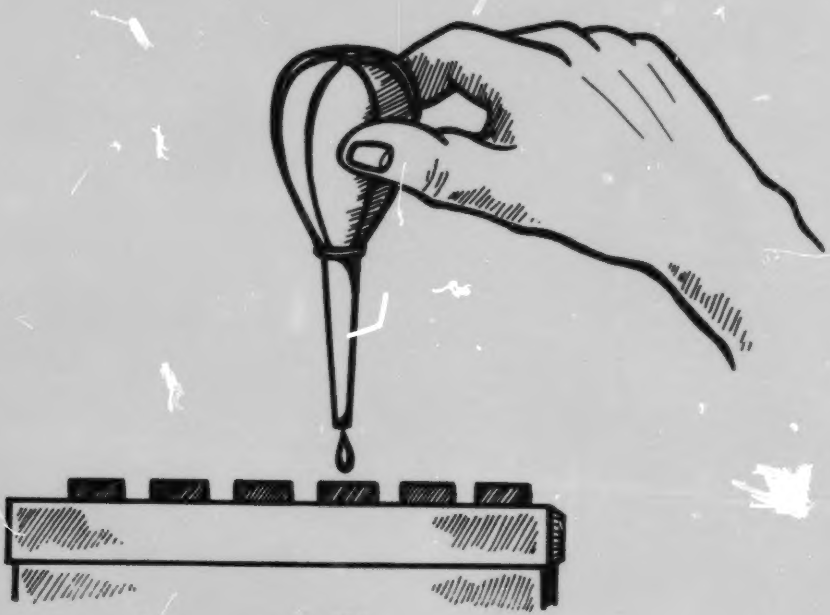
If you get electrolyte on your skin or clothing, immediately wash it off with water.



9. Check all the cells in this manner. Write down the hydrometer reading for each cell.


CELL 1 – 1220
CELL 2 – 1210
CELL 3 – 1250
CELL 4 – 1220
CELL 5 – 1250
CELL 6 – 12

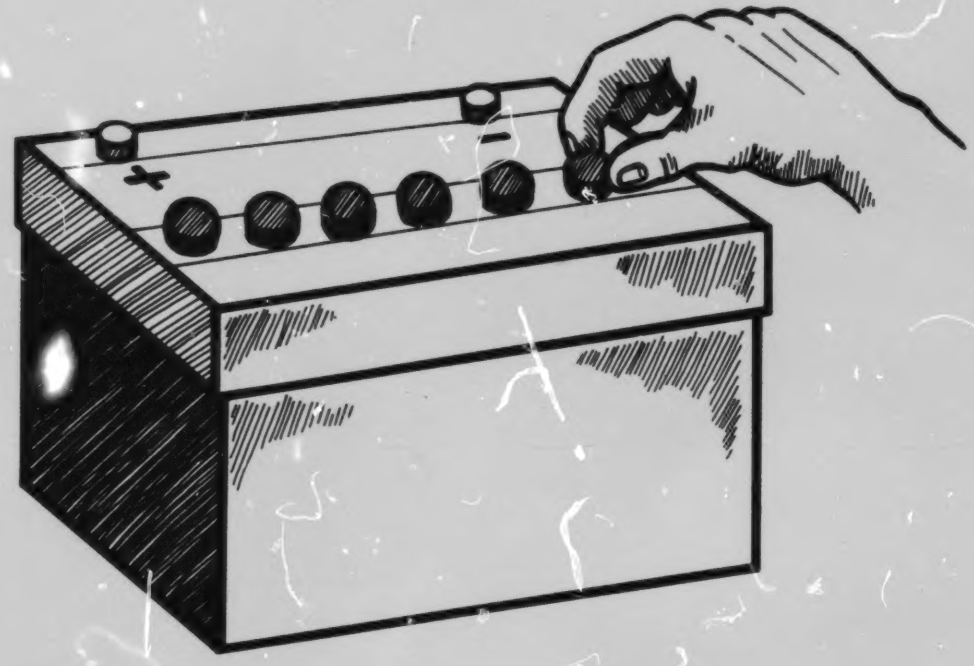
10. Add distilled water to cells that are low. The water must be above the plates.



NOTE!

DO NOT add water to cells before taking the hydrometer readings.

11. Replace and tighten all vent caps on the battery.



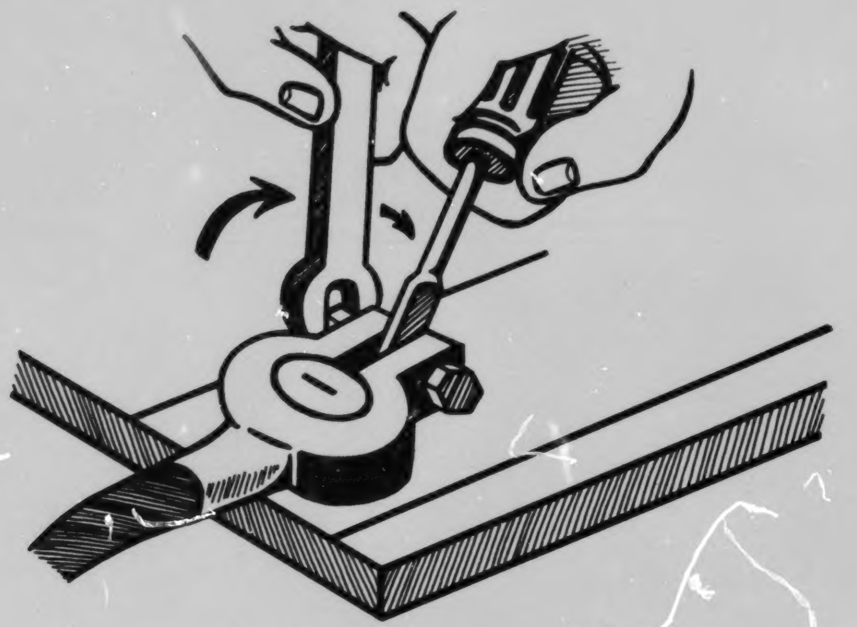
NOTE!

Keep the vents open if the battery is to be recharged.

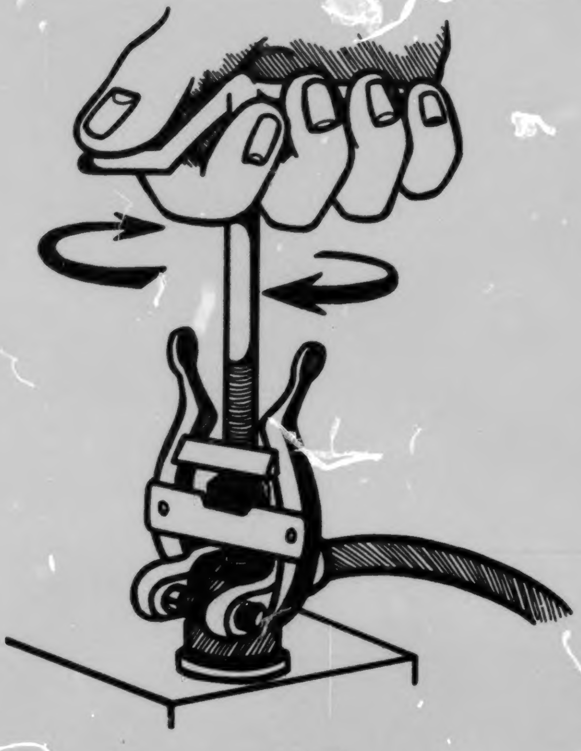
TURN TO NEXT PAGE

C. Steps for Charging a Car Battery.

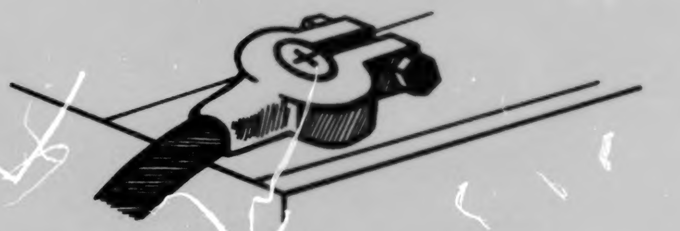
12. Find the negative battery post. Loosen the clamp bolts and open the clamp on the post.



13. Pull off the cable clamp with the battery clamp puller.

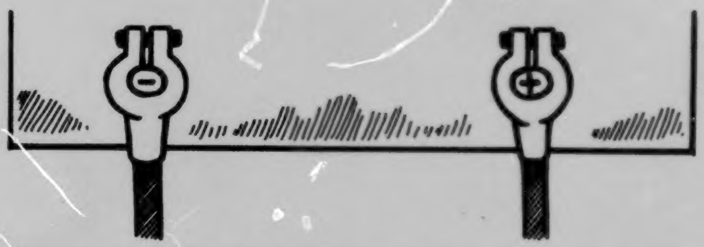


14. Loosen and remove the positive cable clamp from the positive battery post. The positive post is marked (+).

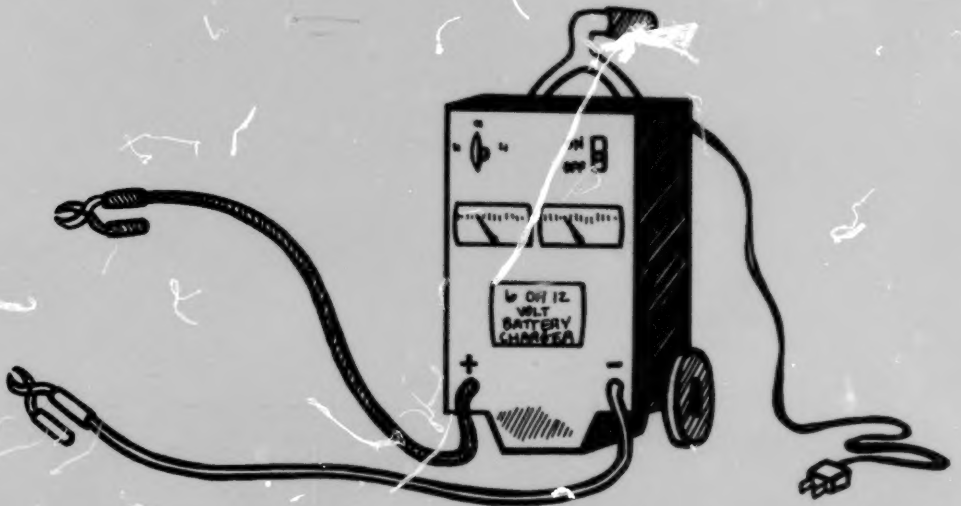


NOTE!

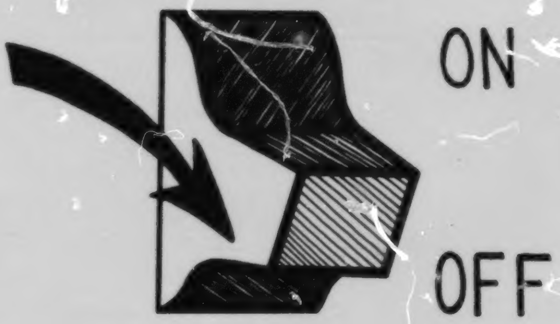
ALWAYS remember to remove the negative (-) battery cable first and remove the postive (+) battery cable last.



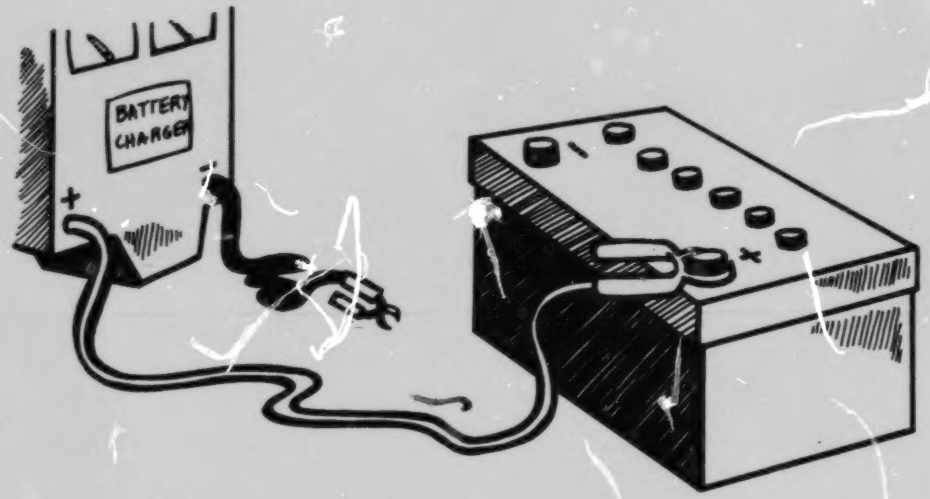
15. Move the battery charger near the battery.


ON
OFF
6 OR 12 VOLT BATTERY CHARGER
+
−

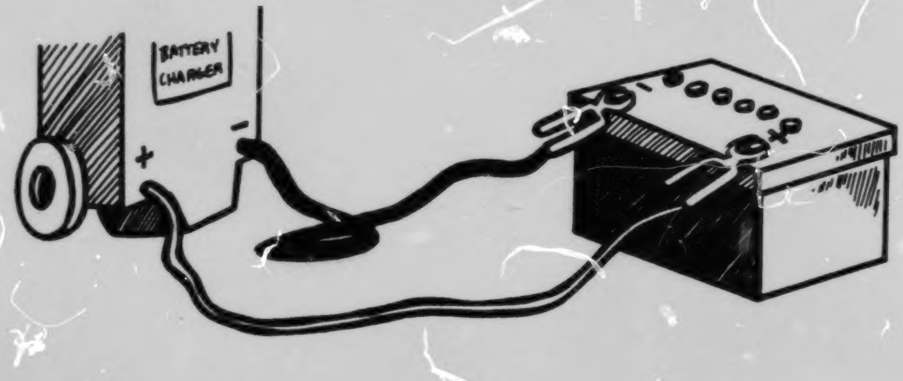
16. Be sure the charger switch is in the OFF position.



17. Connect the red cable (+) from battery charger to the positive post on battery.


BATTERY CHARGER
+
-
-
+

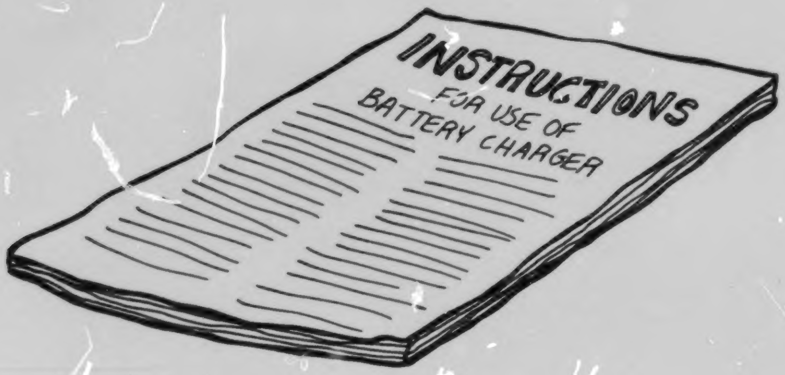
18. Connect the black cable (−) from battery charger to the negative post on battery.


BATTERY CHARGER
+
-
-
+

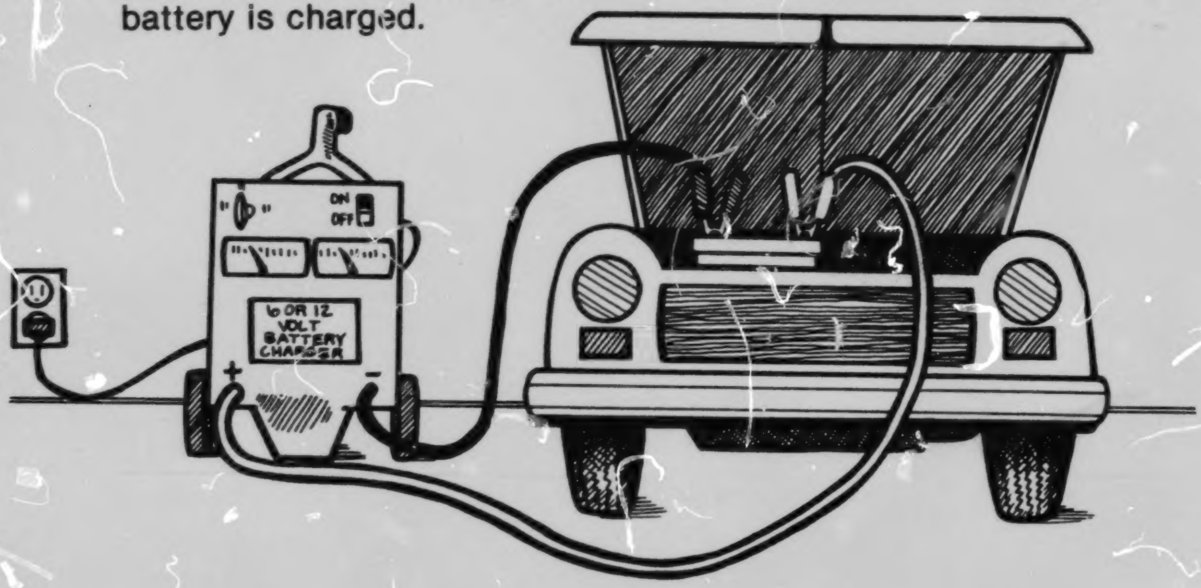
CAUTION!

Always connect positive to positive and negative to negative. An explosion may result if they are connected wrong.

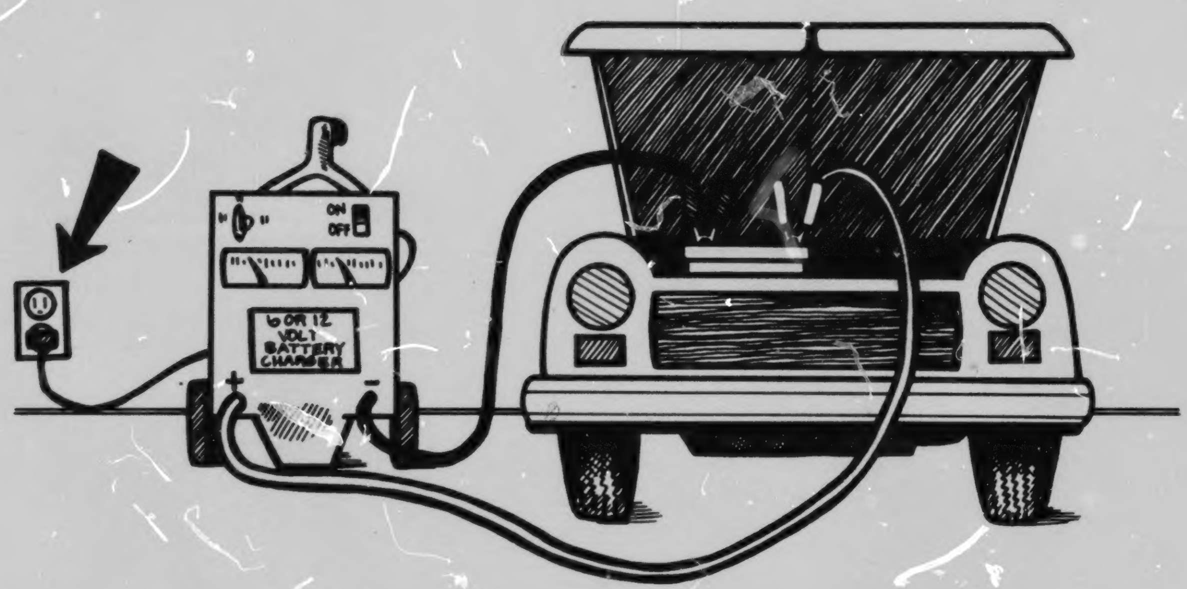
19. Read manufacturer's instructions on battery charger before charging battery.


INSTRUCTIONS
FOR USE OF
BATTERY CHARGER

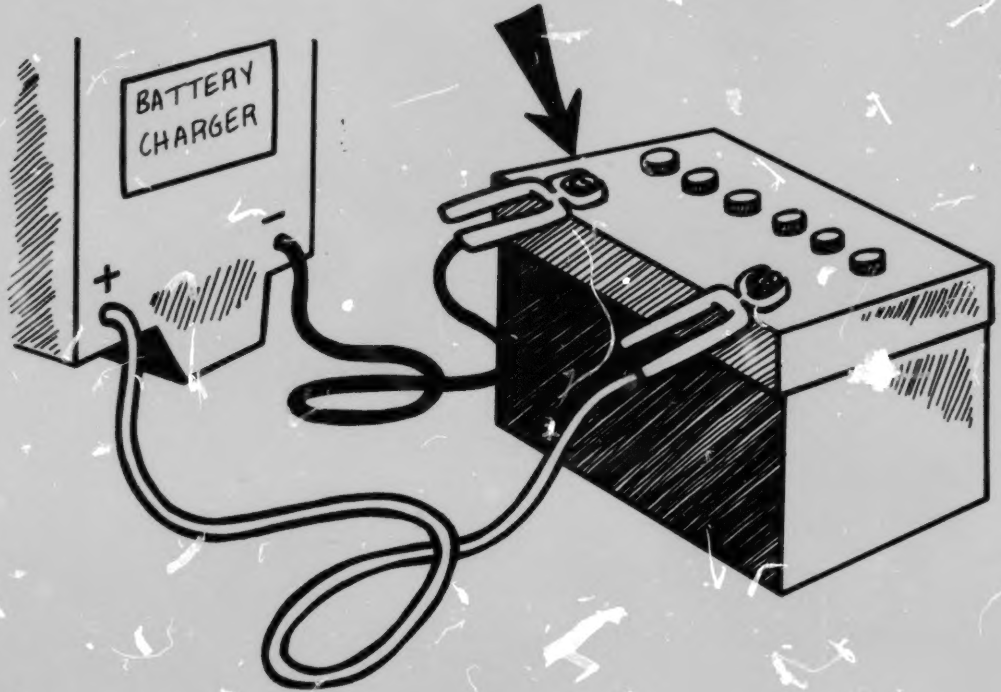
20. Switch on battery charger. Allow it to operate until it shows battery is charged.


ON
OFF
6 OR 12
VOLT
BATTERY
CHARGER
+
-

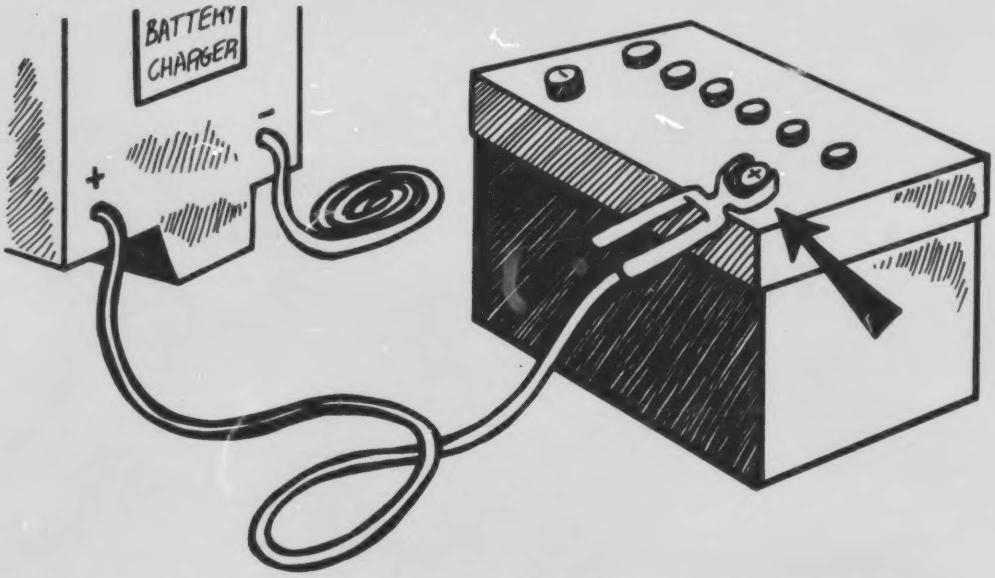
21. Switch off battery charger after battery has charged. Disconnect charger cord from power outlet.


ON
OFF
6 OR 12 VOLT BATTERY CHARGER
+
−

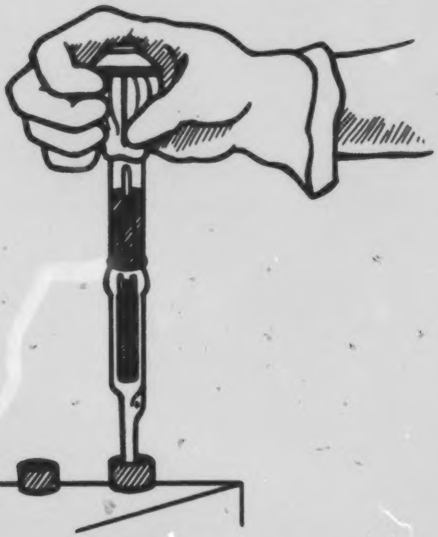
22. Disconnect black charger cable from negative battery post first.


BATTERY CHARGER
+
−

23. Disconnect the red charger cable from the positive battery post after the battery is charged.



24. Check the battery cells with the hydrometer again.

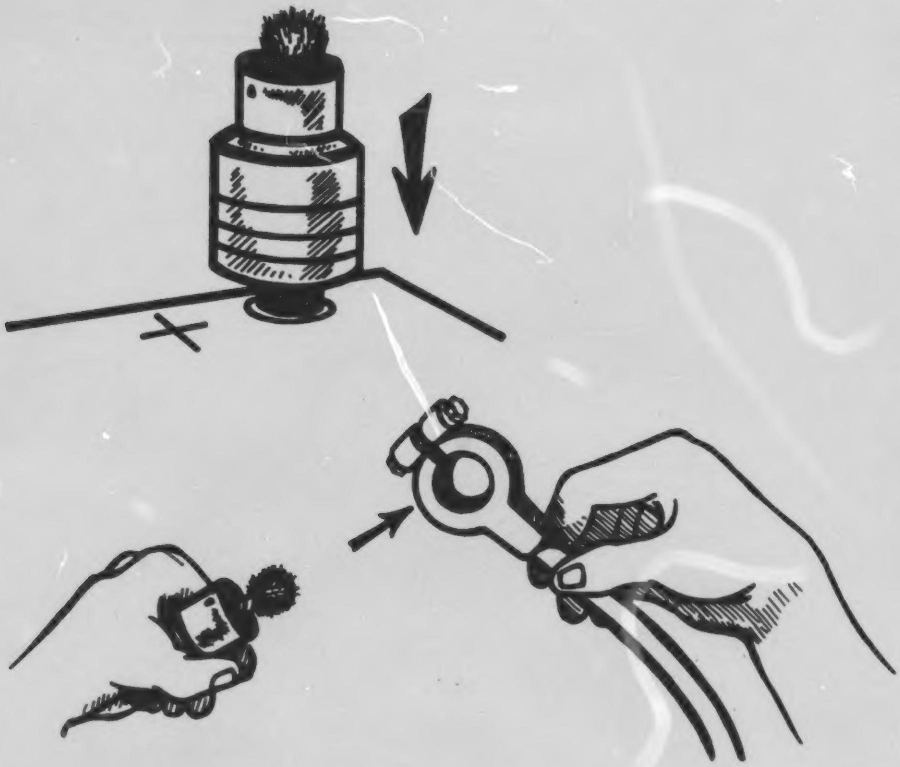


NOTE!

If the difference between the highest and the smallest cell readings is more than 50 points, the battery is bad and should be replaced.

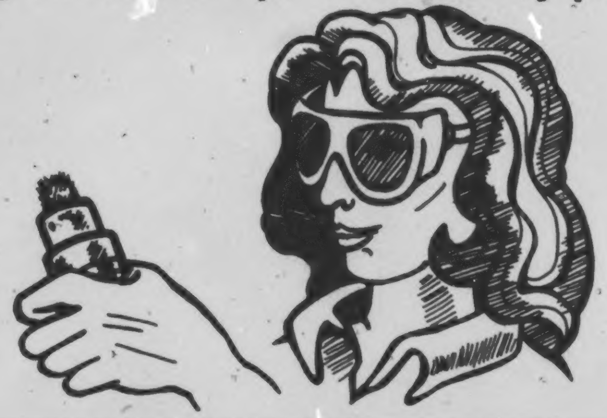
D. Steps for Cleaning a Car Battery.

25. Clean cable clamps and the battery posts.

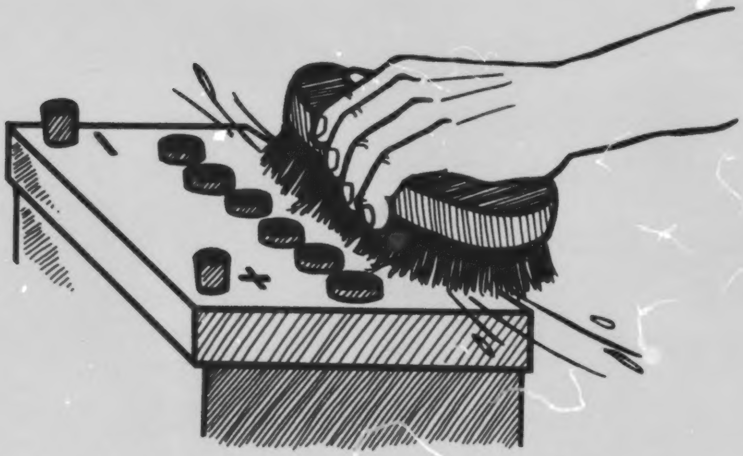


CAUTION!

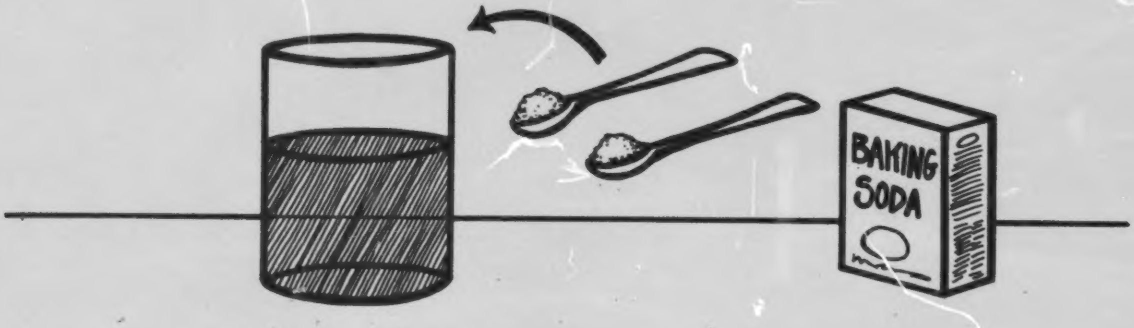
Wear safety goggles to protect your eyes when cleaning cable clamps and battery posts.



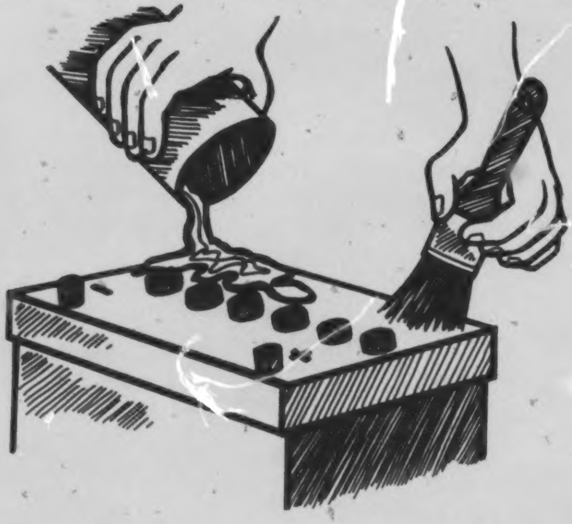
26. Brush dirt and corrosion from the battery case.



27. Mix two tablespoons of baking soda in a pint of water.



28. Cover battery cap vents. Brush battery top and post with the solution.

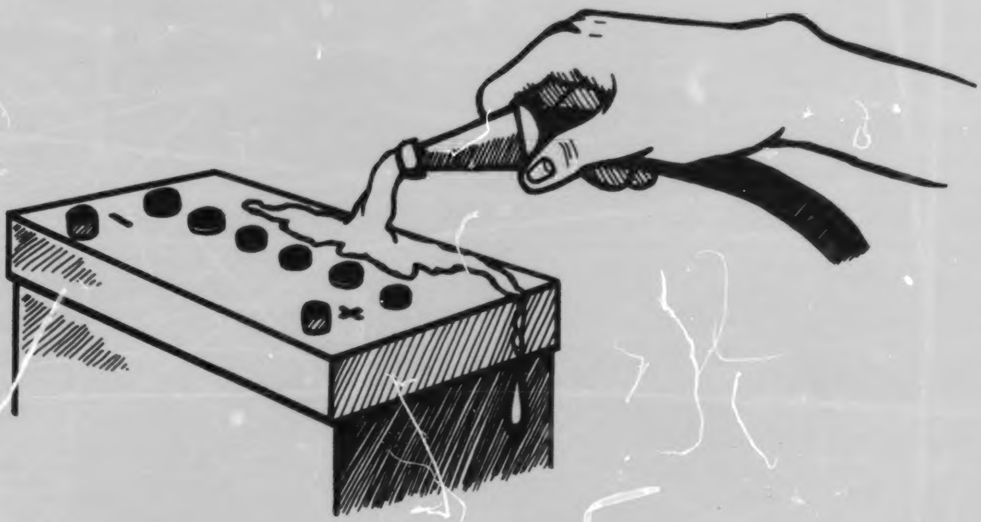


111

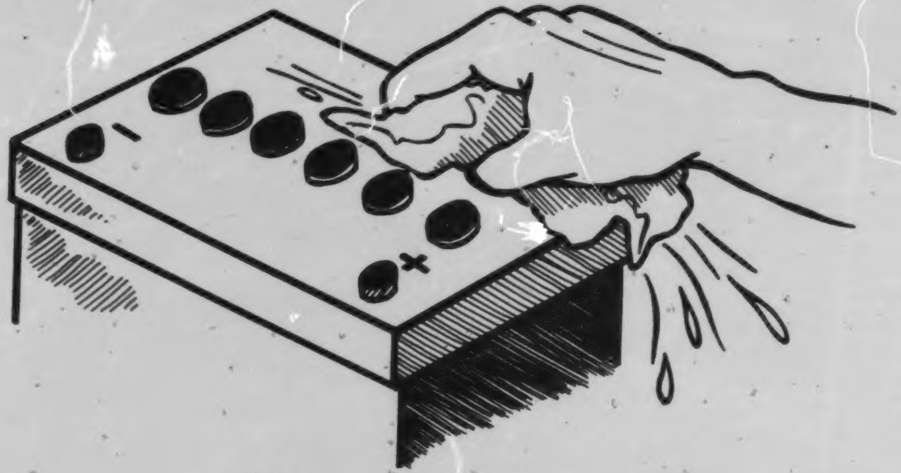
NOTE!

ALWAYS cover the vents when using soda solution on battery. If soda solution enters the battery it can weaken electrolyte in battery.

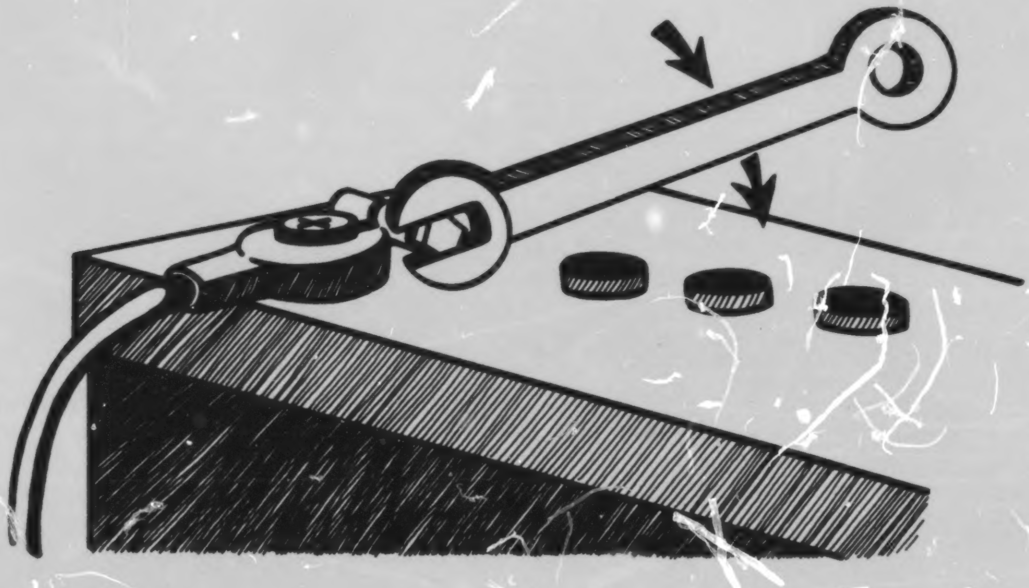
29. Rinse the battery top with clean water.



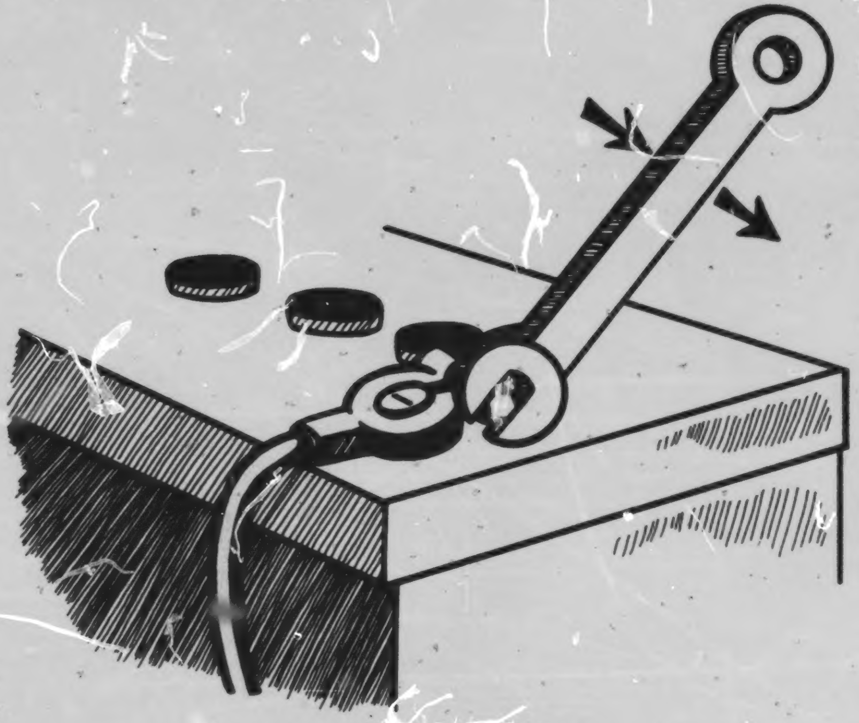
30. Wipe off battery top with a clean shop towel.



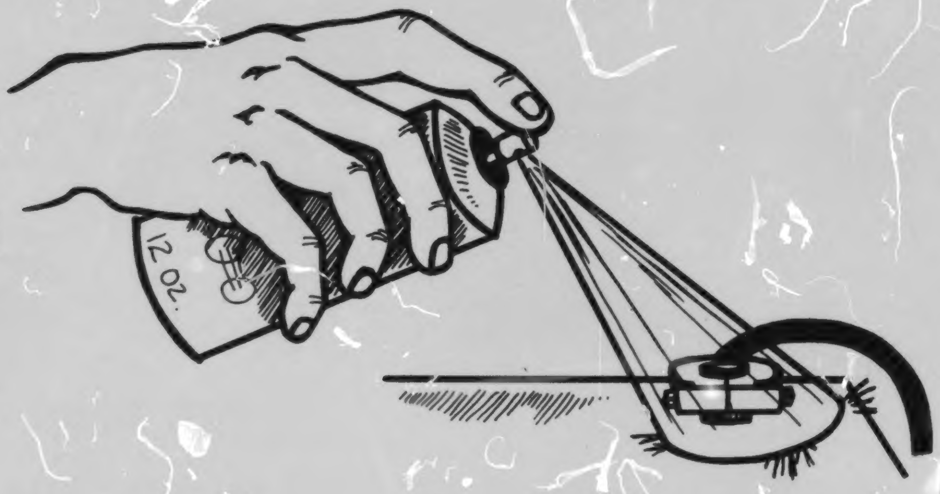
31. Connect red positive cable clamp to the positive (+) battery post.



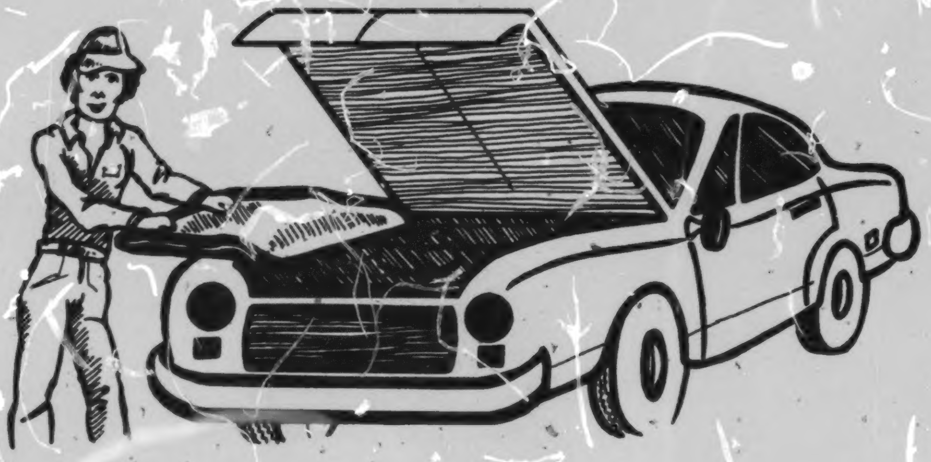
32. Connect black negative cable clamp to the negative (−) battery post.



33. Spray silicone on each battery post and cable clamp connection.



34. Remove fender cover and clean up work area.



35. Return tools and materials to their proper places.

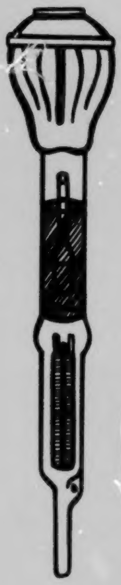
SEE YOUR INSTRUCTOR

Unit 8
Checking, Recharging and Cleaning a Battery

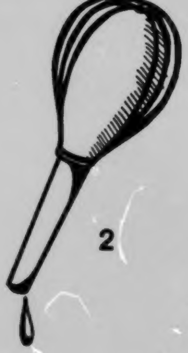
Tools and Materials Identification Exercise

Match each word with the correct object provided below:

____A. Battery Syringe
____B. Hydrometer
____C. Box-end Wrench
____D. Screwdriver
____E. Battery Charger
____F. Cable-Clamp Cleaner
____G. Silicone Spray
____H. Bristle Brush
____ I. Battery Clamp Puller
____ J. Baking Soda



1



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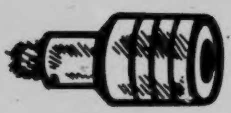

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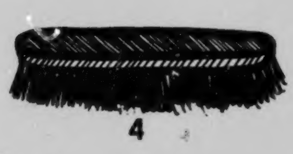

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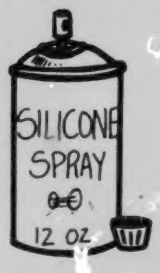
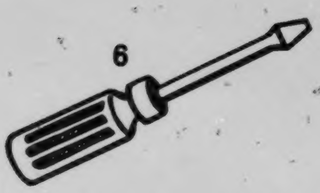

SILICONE
SPRAY
12 OZ

5



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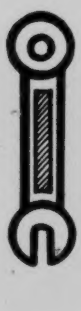

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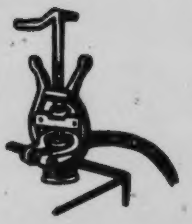

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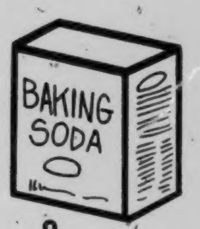
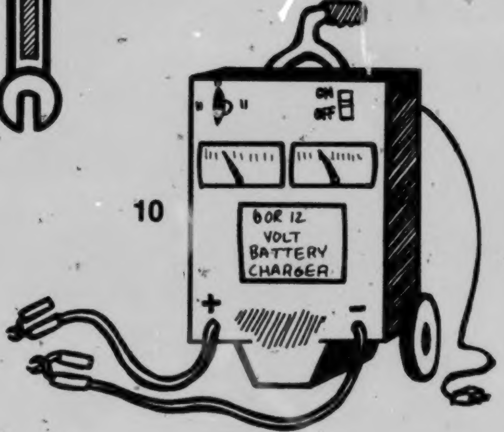

BAKING
SODA

9


ON
OFF
6 OR 12
VOLT
BATTERY
CHARGER
+
−

10

Unit 8
Checking, Recharging and Cleaning a Battery

Practical Exercise Performance Checklist

The student ______________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified:			
a. Battery Syringe			
b. Hydrometer			
c. Box-end Wrench			
d. Screwdriver			
e. Battery Charger			
f. Cable Clamp Cleaner			
g. Silicone Spray			
h. Bristle brush			
i. Battery Clamp Puller			
j. Baking Soda			
2. Wore proper safety equipment.			
3. Opened car hood and located battery.			
4. Checked battery case for leaks or cracks.			
5. Removed vent caps.			
6. Properly filled hydrometer with electrolyte from each battery cell.			
7. Correctly read the electrolyte and recorded it for each cell.			
8. Squeezed electrolyte into cell after reading.			
9. Checked all the cells.			
10. Flushed the hydrometer with clean water after checking all cells.			
11. Added distilled water to the cells that were low in electrolyte.			

Tasks	Yes	No	Comments
12. Replaced and tightened all vent caps.			
13. Located negative battery post and loosened cable clamp.			
14. Pulled off cable clamp from negative post.			
15. Loosened and removed positive cable clamp from positive battery post.			
16. Moved battery charger near battery.			
17. Checked to be sure the battery charger was turned off.			
18. Connected red cable from charger to positive battery post.			
19. Connected black cable from charger to negative battery post.			
20. Plugged in battery charger and switched it on.			
21. Properly set the battery charge control and allowed time for battery to charge properly.			
22. Turned charger switch off and disconnected charger cables from battery posts.			
23. Coiled charger cables and power cord and hung them on charger.			
24. Rechecked battery cells with hydrometer to check condition of battery.			
25. Returned charger to its proper place.			
26. Cleaned cable clamps and battery posts.			
27. Brushed dirt and corrosion from battery case.			
28. Prepared baking soda solution.			

Tasks	Yes	No	Comments
29. Covered vents and brushed battery top and posts with solution.			
30. Correctly rinsed battery top with clean water.			
31. Wiped battery top clean with shop towel.			
32. Connected red cable clamp to positive (+) battery post.			
33. Connected black cable clamp to negative (−) battery post.			
34. Applied silicone spray on battery post and cable clamp connections.			
35. Removed fender cover and cleaned work area.			
36. Returned tools and materials to their proper places.			

Satisfactory Performance ☐
Repeat Exercise ☐
Should Move On ☐

Instructor's Signature　　Date

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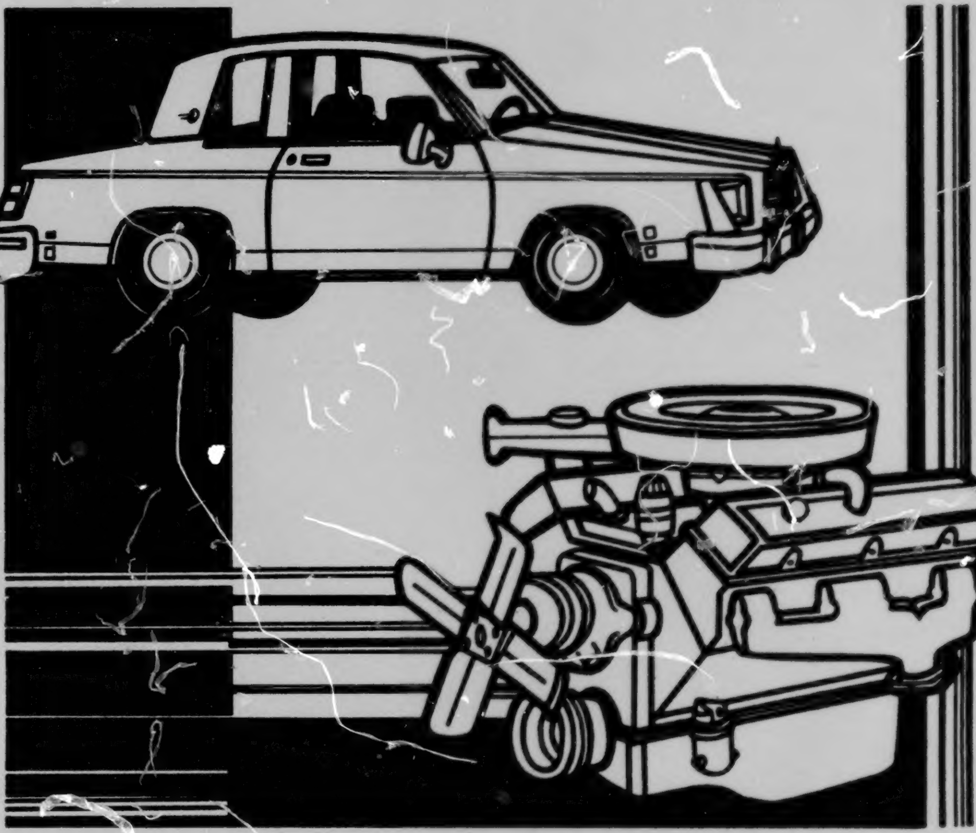
Vocational Preparation Curriculum
AUTO SERVICE



Unit 9

Jump Starting a Car

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION

INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

Unit 9
Jump Starting a Car

Jump Starting a Car

After you study this lesson, you should be able to:

1. Identify tools and materials used to jump start a car.
2. Safely jump start a car which has a dead battery.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

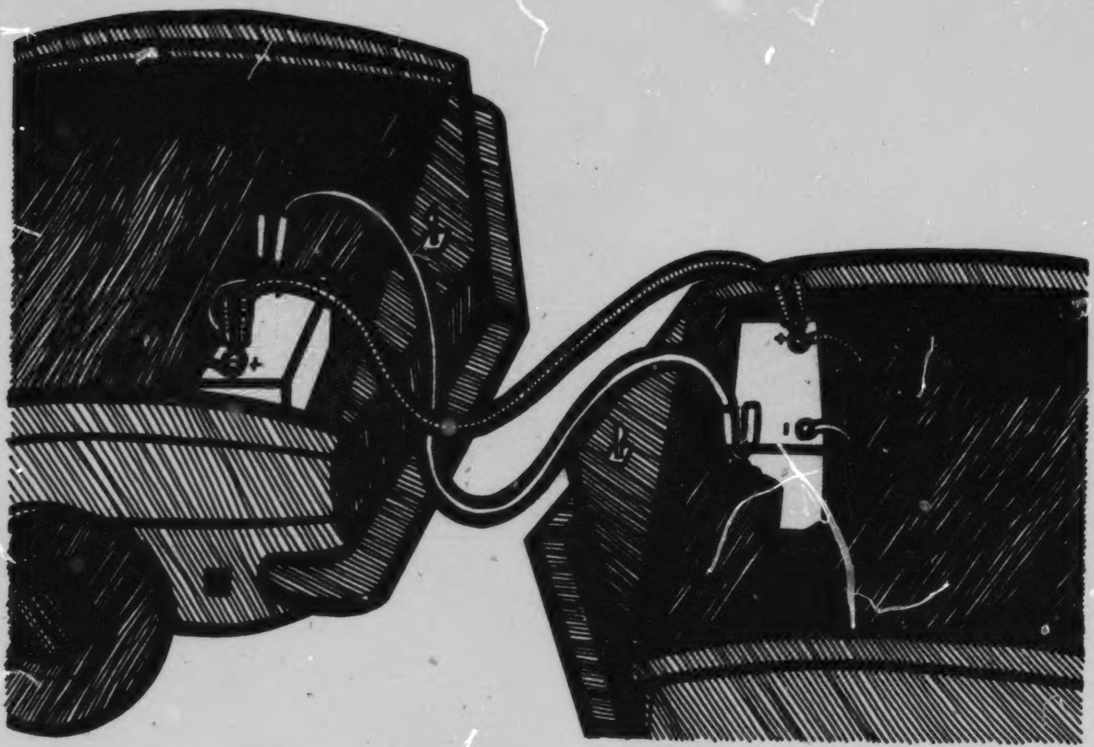
TURN THE PAGE AND BEGIN

Unit 9
Jump Starting a Car

Introduction

Sometimes a car will not start because the battery is too weak to start the car engine. A battery does not necessarily have to be replaced when this happens. You will need to jump start the car with a good battery from another car. One important rule to remember is not to let the cars touch.

In this lesson, you will learn how to jump start a battery.



TURN TO NEXT PAGE

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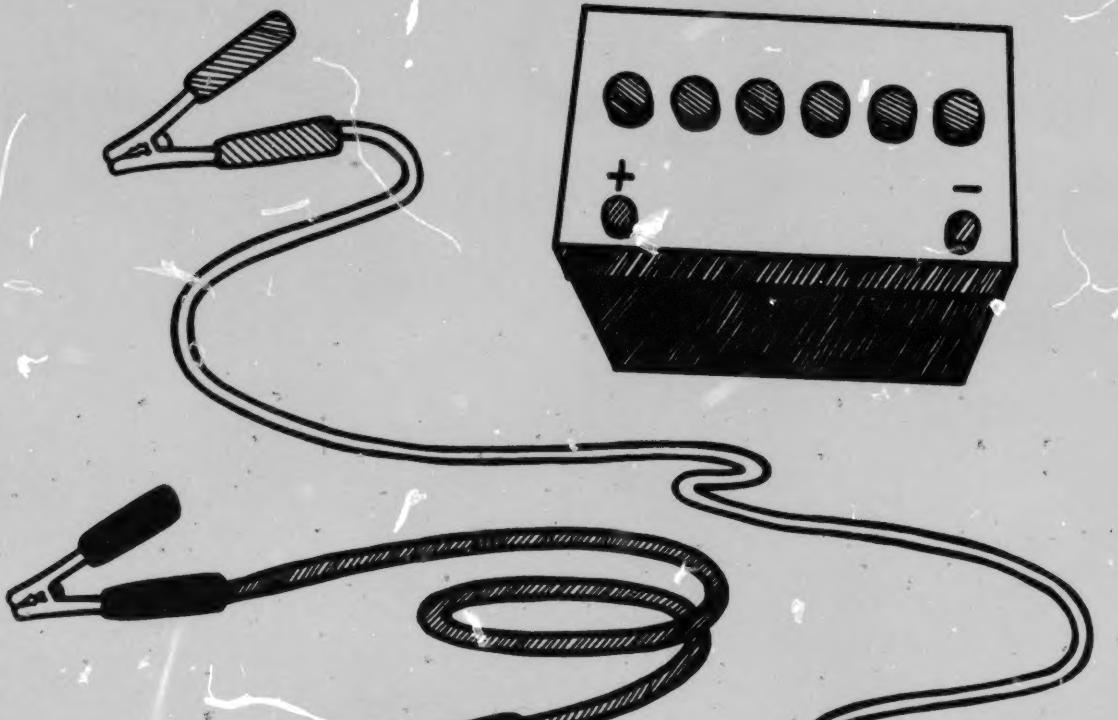
Unit 9
Jump Starting a Car

A. Tools, Materials and Equipment for Jump Starting a Car.

1. **JUMPER CABLES:** Heavy duty wires used to carry electrical current from a good battery to a weak battery.



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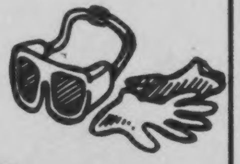
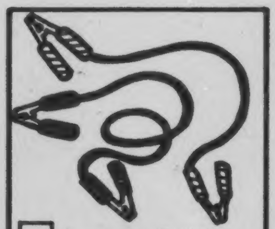
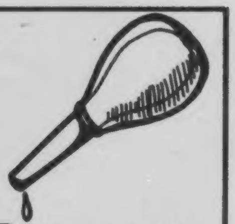
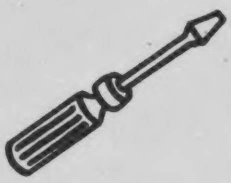
B. Steps for Jump Starting a Car.

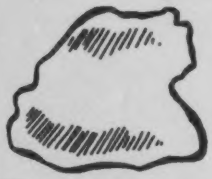
1. Find and Check Off the following:


☐ Safety Equipment

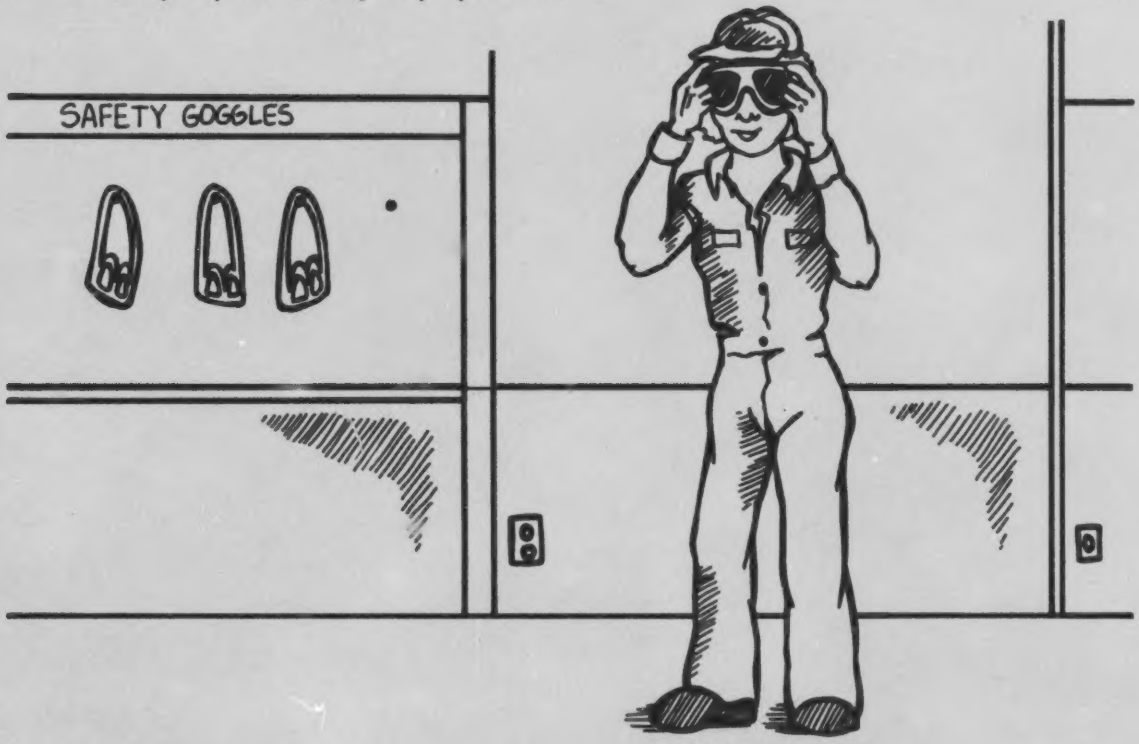

☐ Jumper Cables


☐ Battery Syringe

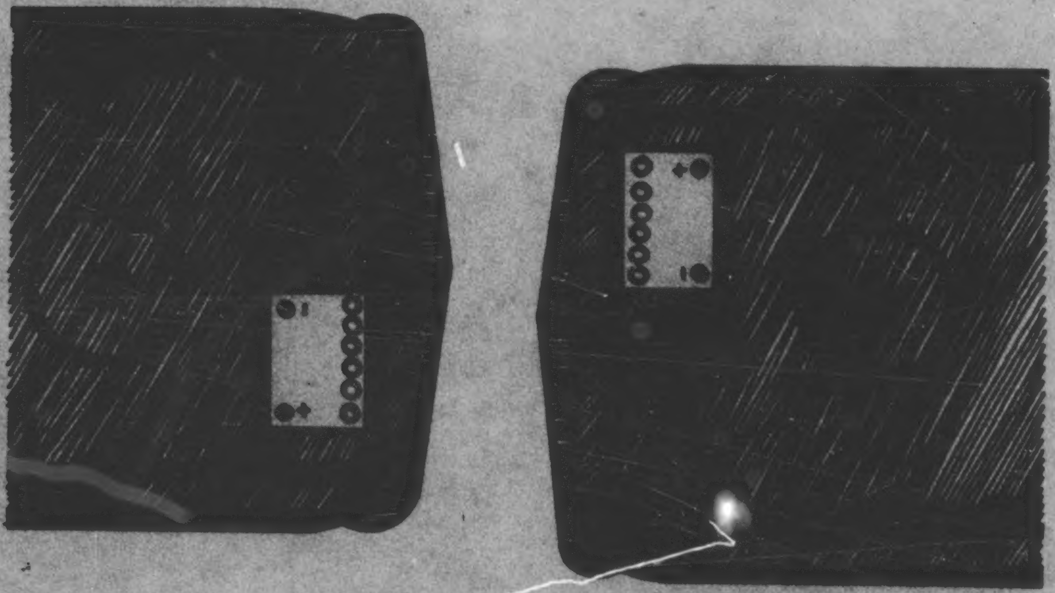

☐ Screw Driver


☐ Shop Towels

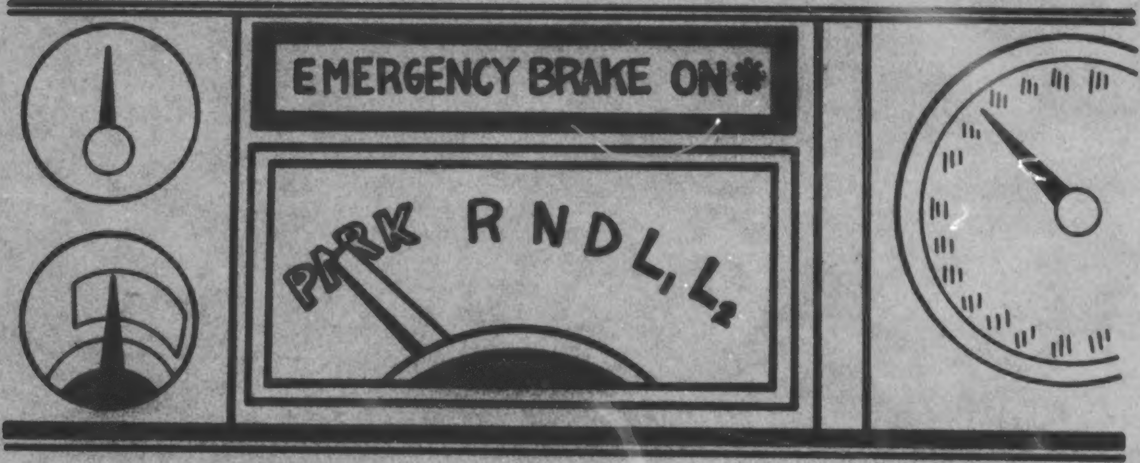
2. Wear proper safety equipment.



3. Position two cars so the batteries of each are as close as possible.



4. Put the transmissions in 'park' or 'neutral' and put on the emergency brakes.


EMERGENCY BRAKE ON
PARK R N D L_1 L_2

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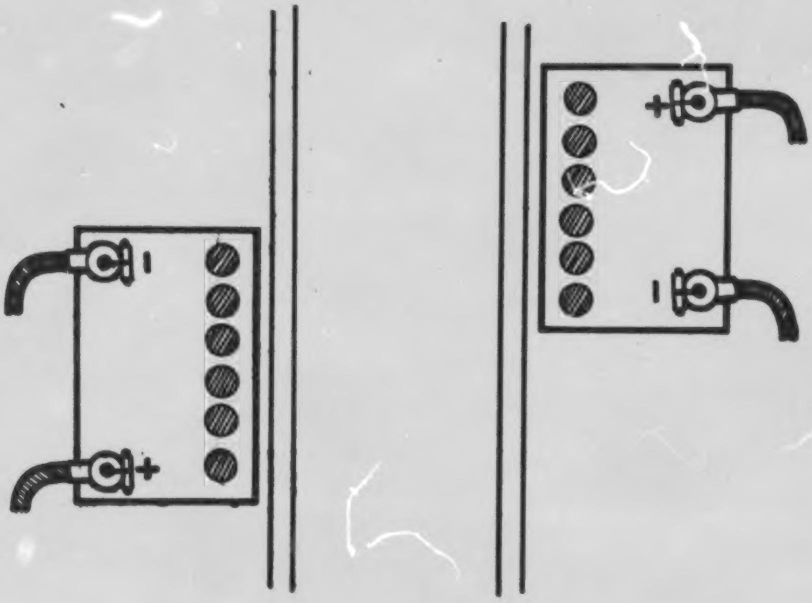
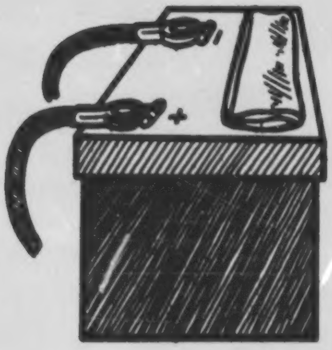
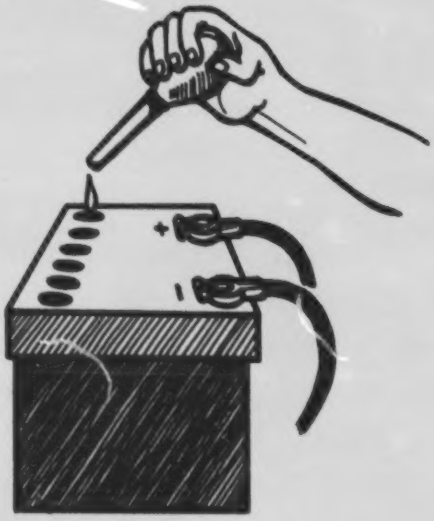
5. Open the hoods of each car. Check the two batteries to make sure they are both 12 volt or both 6 volt.



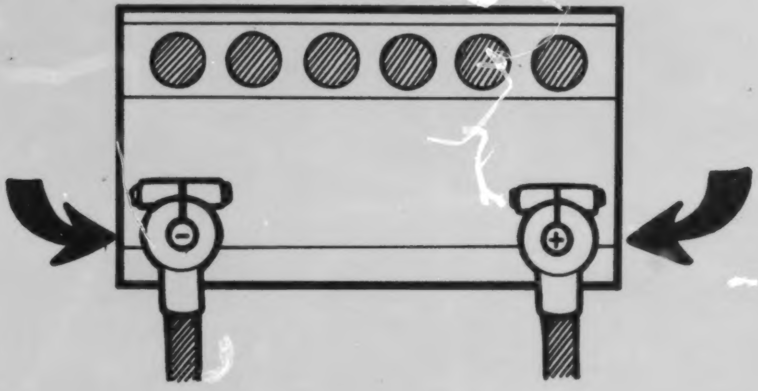
6. Remove the vent caps from each battery. Check water level of the dead battery. Add water if necessary.



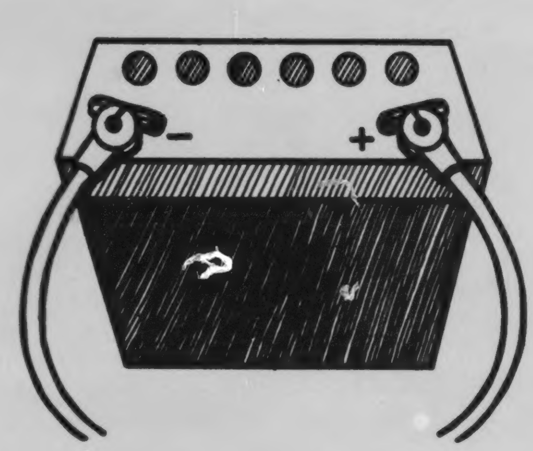


Lay a cloth over the open vents to prevent spraying battery acid.

7. Locate the negative (−) and positive (+) battery post.

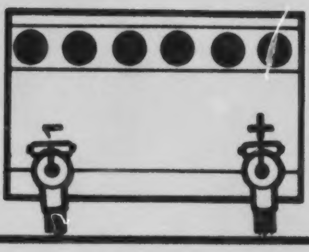


8. Check battery cable connection to make sure they are clean and tight.



CAUTION!

Open battery vents before jump starting. Never jump start a car which has frozen battery liquid. Trapped gasses can explode.



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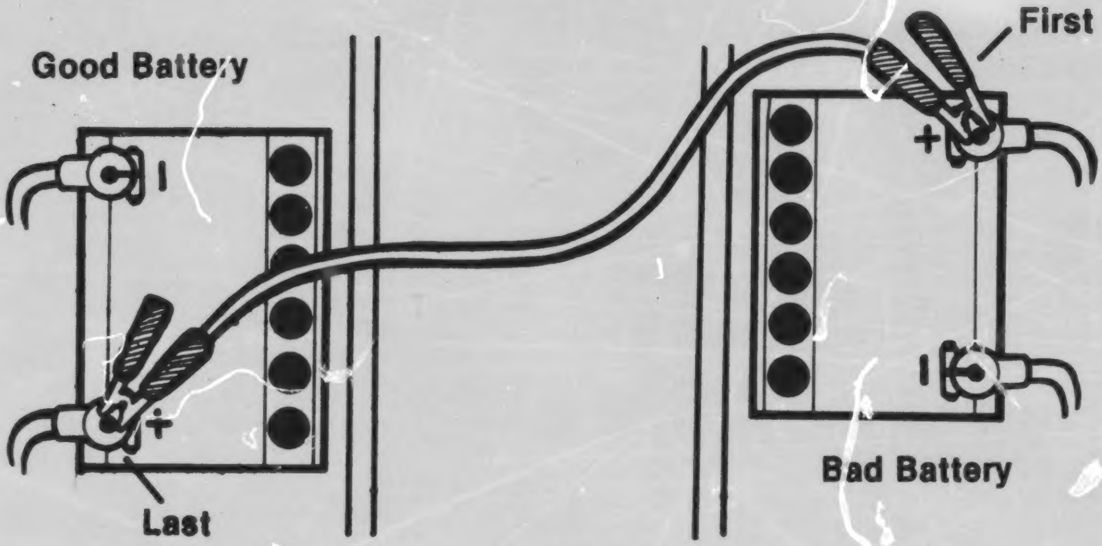
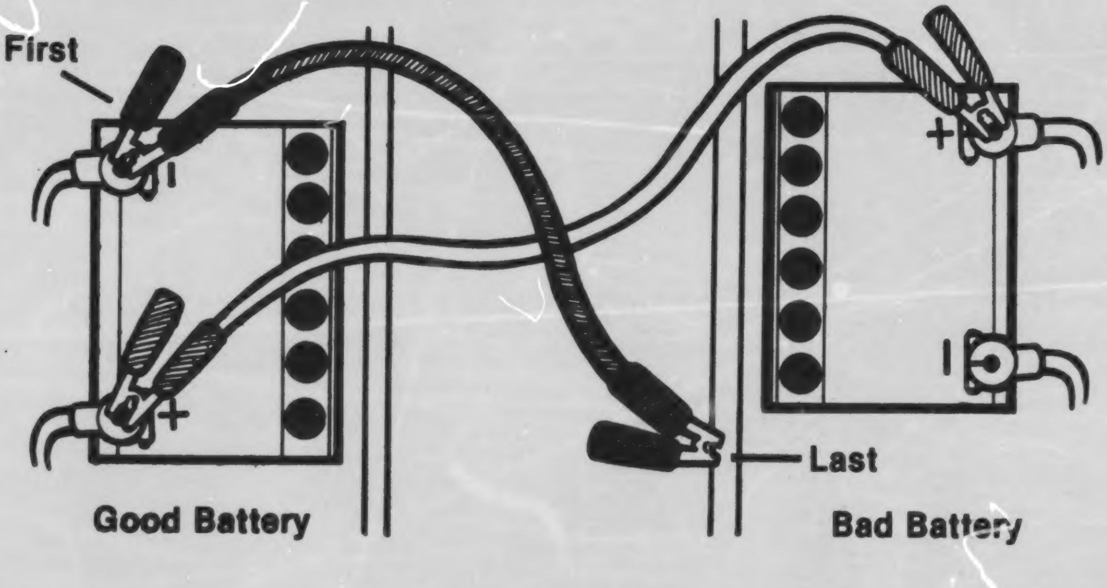
9. Connect red cable clamp to the positive post of the dead battery.


First
Good Battery
+
+
Last
Bad Battery

Connect the other red cable clamp to the positive post of the good battery.

10. Connect black cable clamp to the negative battery post of the good battery.


First
+
+
Last
Good Battery
Bad Battery

11. Connect other black cable clamp to engine block or frame of the dead car.

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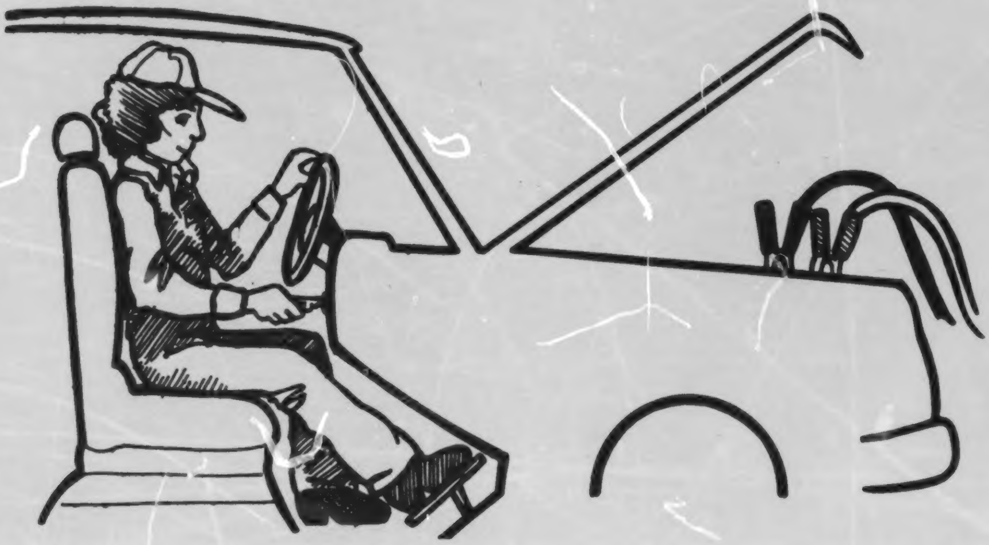
CAUTION!

- **Never bend over the batteries when you are connecting cables to them.**
- **Keep jumper cables away from engine belts and fans.**
- **Never allow red and black cables to touch when they are connected to the battery.**

12. Try to start the car with dead battery. If it does not start, start car with the good battery. Run at fast idle.



Allow time for the dead battery to recharge.

13. Now start the car with the dead battery.

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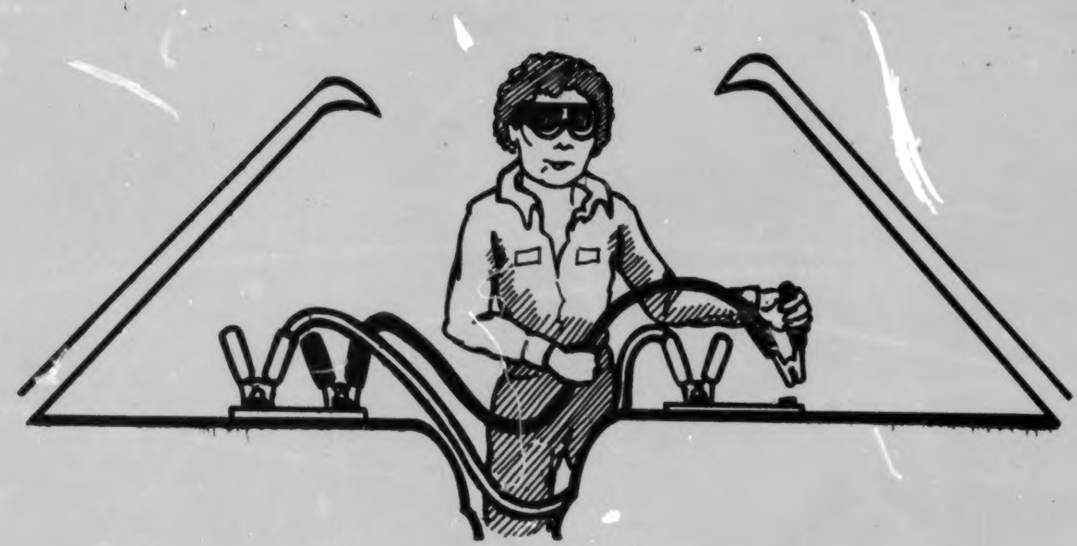
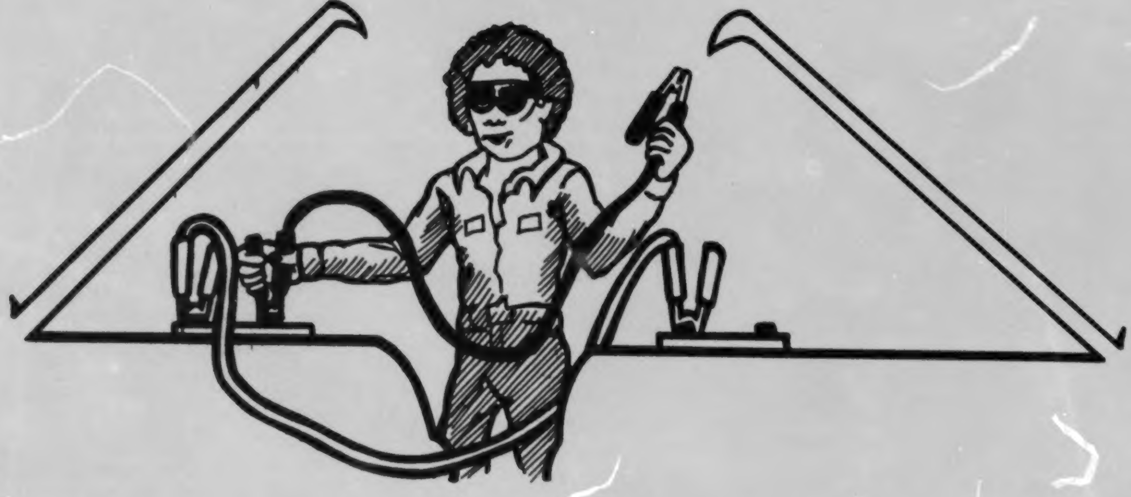
14. Disconnect black cable clamp from the engine block or frame.

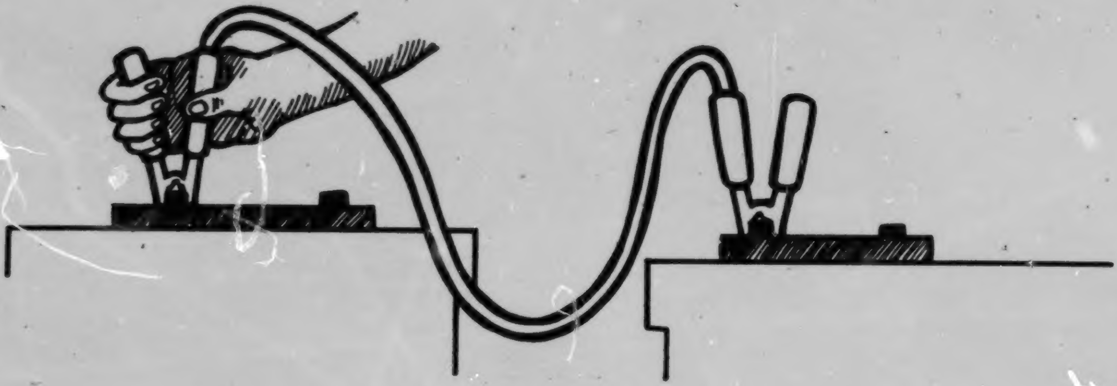


15. Disconnect the other black cable clamp from the negative battery post in the other car.

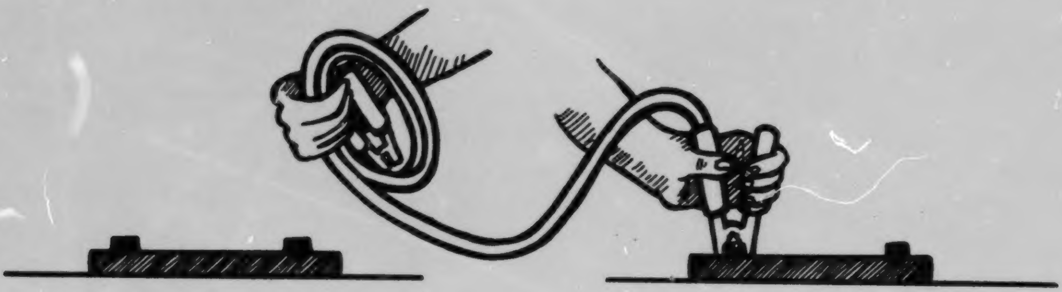


129

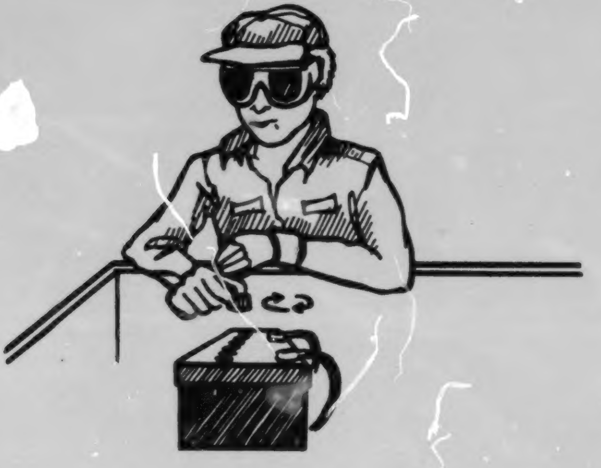
16. Disconnect the red cable clamp from the positive battery post of the good battery.



17. Disconnect the other red cable clamp from the positive post of the other battery.



18. Remove the cloths from the vents and replace the vent caps on each battery.



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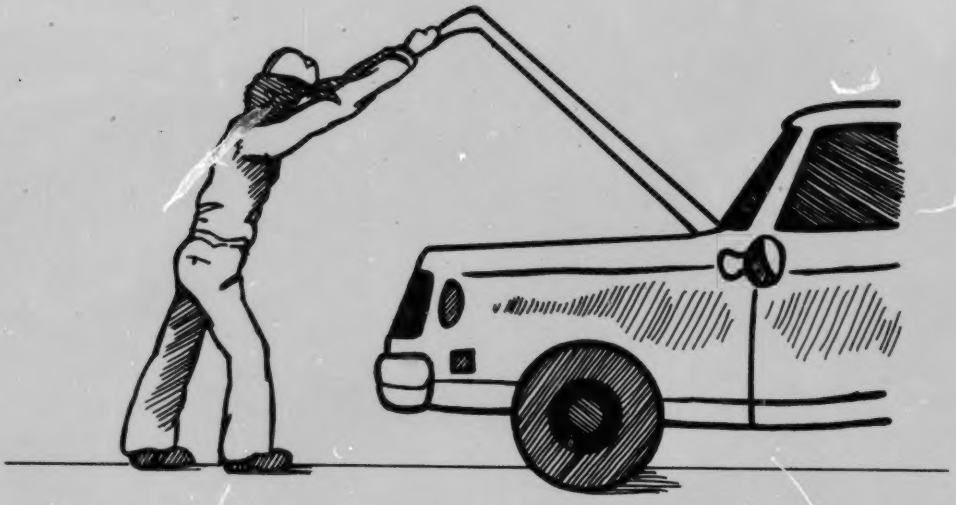
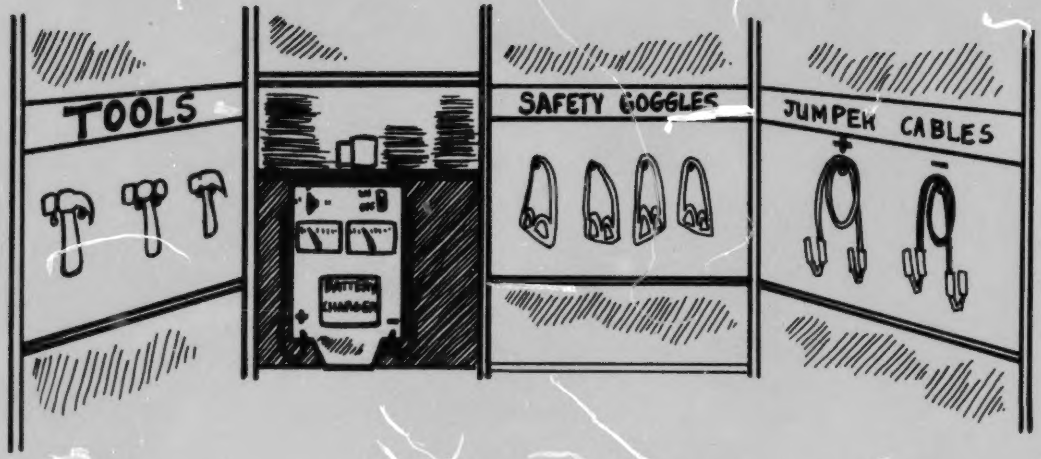
19. Close the hoods. Shut off the engine of the car you used to jump start. Allow the jump started car to run until the battery has time to recharge.



20. Return tools and materials to their proper places and clean the work area.


TOOLS
BATTERY CHARGER
SAFETY GOGGLES
JUMPER CABLES
+
−

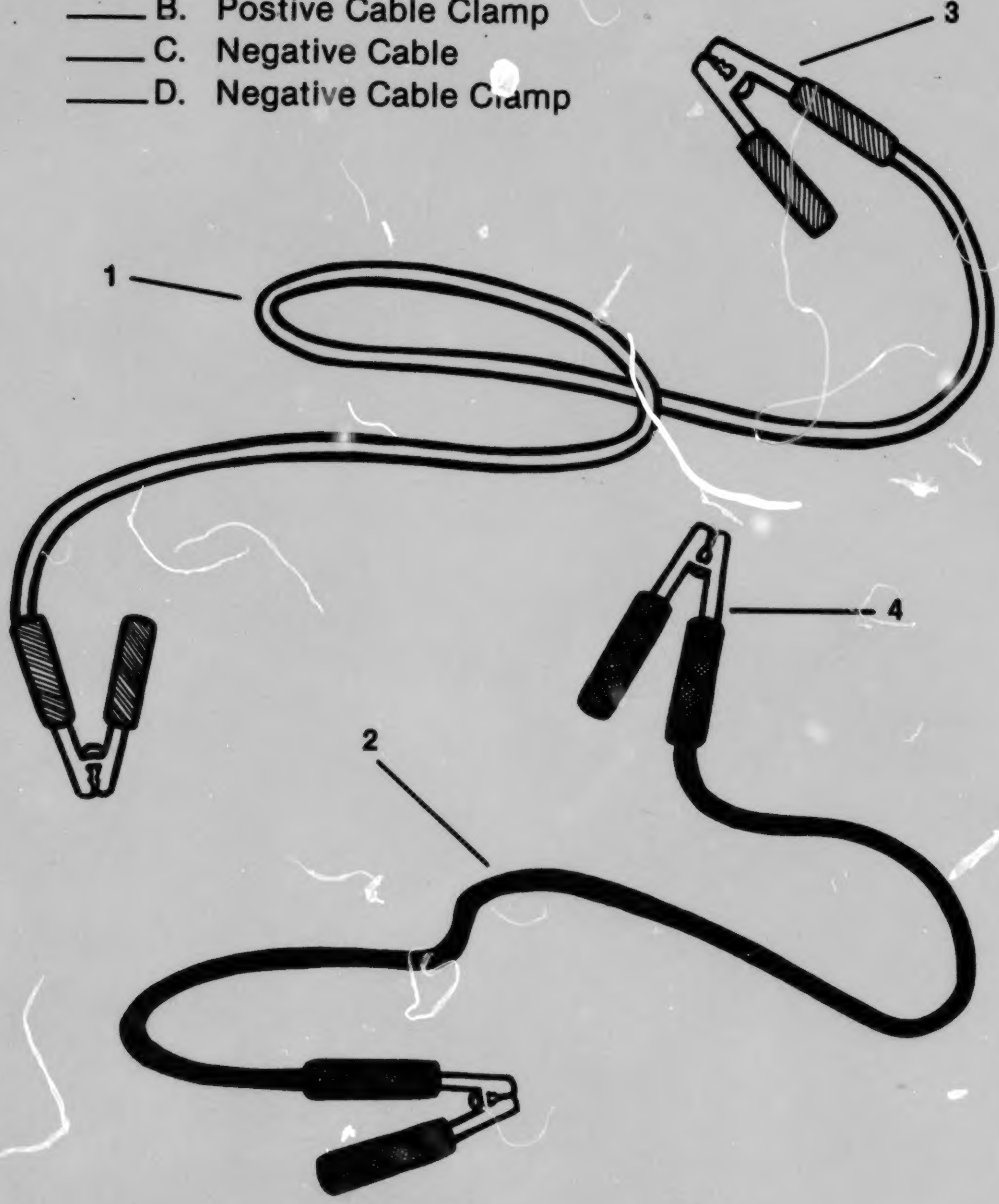
SEE YOUR INSTRUCTOR

Unit 9
Jump Starting a Car

Tools and Materials Identification Exercise

Match the words with their correct names provided below:

____ A. Positive Cable
____ B. Postive Cable Clamp
____ C. Negative Cable
____ D. Negative Cable Clamp



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Unit 9
Jump Starting a Car

Practical Exercise Performance Checklist

The Student ______________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified:			
a. Positive cable			
b. Positive cable clamp			
c. Negative cable			
d. Negative cable clamp			
2. Wore proper safety equipment.			
3. Properly positioned the two cars.			
4. Put transmissions in 'park' or 'neutral' and set parking brakes.			
5. Turned off ignition and other electrical parts.			
6. Checked and cleaned battery terminals.			
7. Checked water level in dead battery and added water if necessary.			
8. Located negative and positive battery posts in both cars.			
9. Used red cable clamps to connect positive post of bad battery to positive post of good battery.			
10. Used black cable clamps to connect negative post of good battery to the engine block of car having dead battery.			
11. Kept cables away from fans and belts.			
12. Did not allow battery cable clamps to touch while connected to batteries.			

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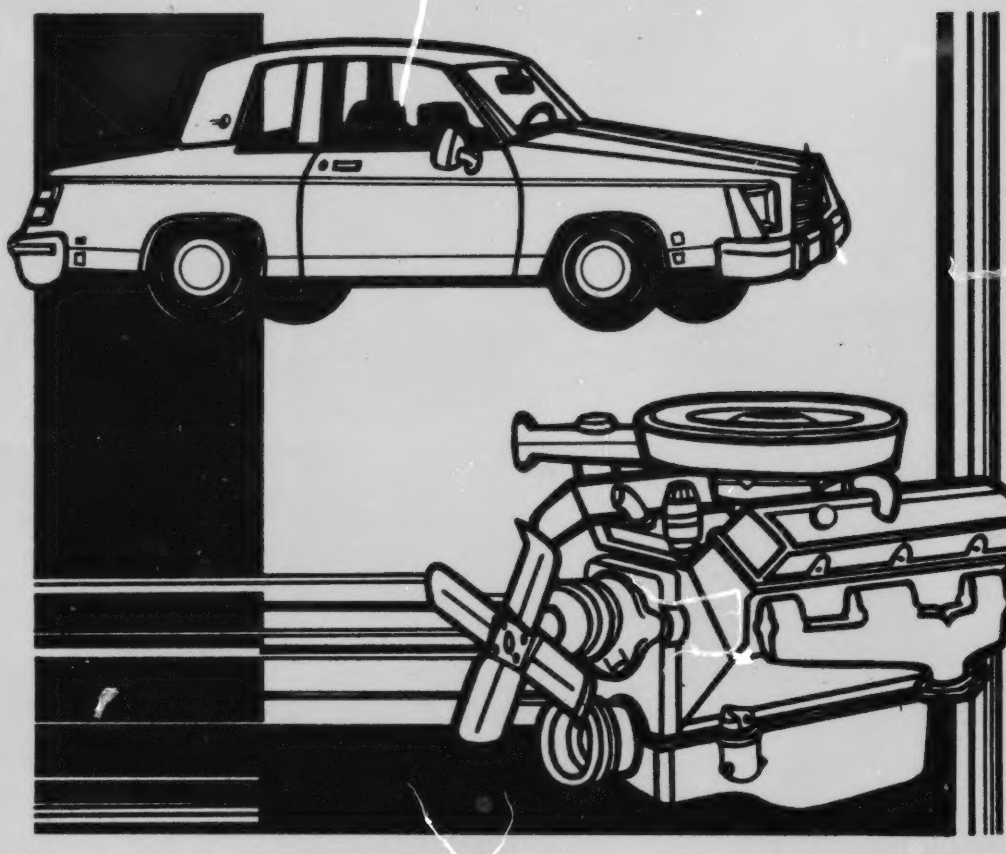
Tasks	Yes	No	Comments
13. Checked cable connections to ensure that they were right.			
14. Tried to start the car having the dead battery.			
15. Started engine in car with good battery and let it run.			
16. Started car with dead battery and let it run.			
17. First disconnected black cable clamp from engine block of car with dead battery.			
18. Disconnected other black clamp from negative post of good battery.			
19. Disconnected red cable clamp from positive post of good battery.			
20. Disconnected other red clamp from positive post of dead battery.			
21. Removed fender cover from fender of car.			
22. Closed engine hoods and returned tools and materials.			

Satisfactory Performance ☐
Should Move On ☐
Repeat Exercise ☐

Instructor's Signature ________ Date ________

Vocational Preparation Curriculum

AUTO SERVICE



Unit 10

Installing Antifreeze in a Car

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION
iml
INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

Unit 10
Installing Antifreeze in a Car

Installing Antifreeze in a Car

After you study this lesson, you should be able to:

1. Identify tools and materials used to install antifreeze in a car radiator.
2. Properly install antifreeze in a car.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ I can do all the tasks above and want my instructor to give me the Practical Exercise.

→ SEE YOUR INSTRUCTOR

2. ☐ I want to study the information in this unit before I do the Practical Exercise.

→ TURN THE PAGE AND BEGIN

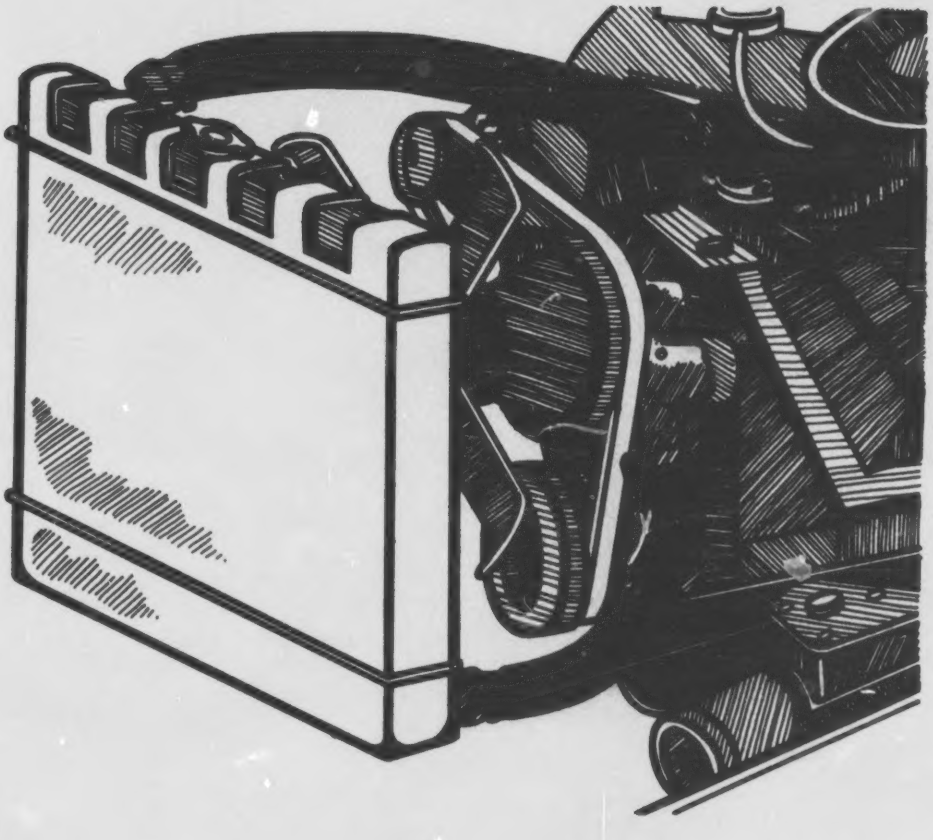
Unit 10
Installing Antifreeze in a Car

Introduction

Antifreeze coolant in a radiator keeps the engine cool in summer and prevents radiator water from freezing in the winter.

When antifreeze becomes old and dirty, it does not do its work well. For this reason it is important to check the antifreeze regularly.

If antifreeze contains rusty particles it should be changed. In this lesson you will learn how to change antifreeze coolant.

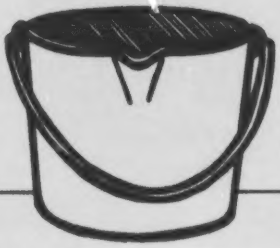


TURN TO NEXT PAGE

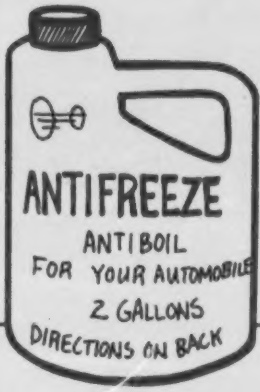
Unit 10
Installing Antifreeze in a Car

A. Tools, Materials and Equipment for Installing Antifreeze in a Car.

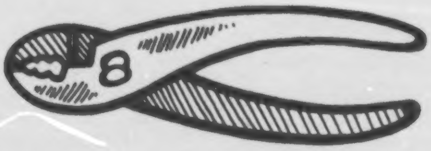
1. **BUCKET:** Container to catch old antifreeze as it is drained from radiator.



2. **ANTIFREEZE:** Liquid used in radiator water to prevent freezing and boiling.


ANTIFREEZE
ANTIBOIL
FOR YOUR AUTOMOBILE
2 GALLONS
DIRECTIONS ON BACK

3. **PLIERS:** Used to open and close radiator drain. This drain is called the petcock.



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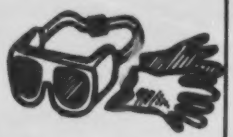
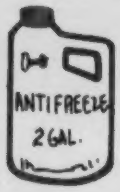
B. Steps for Installing Antifreeze in a Car.

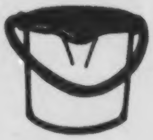
1. Find and Check Off the following:



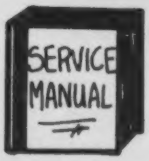
☐ **Safety Equipment**


ANTIFREEZE
2 GAL.

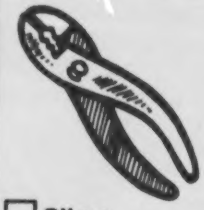
☐ **Antifreeze**



☐ **Bucket**

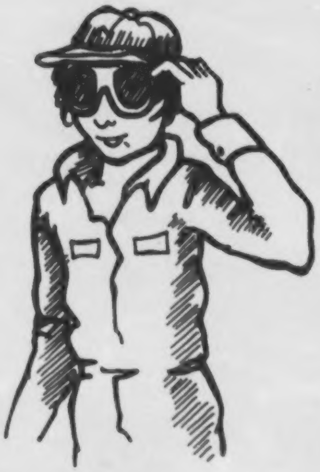

SERVICE
MANUAL

☐ **Service Manual**

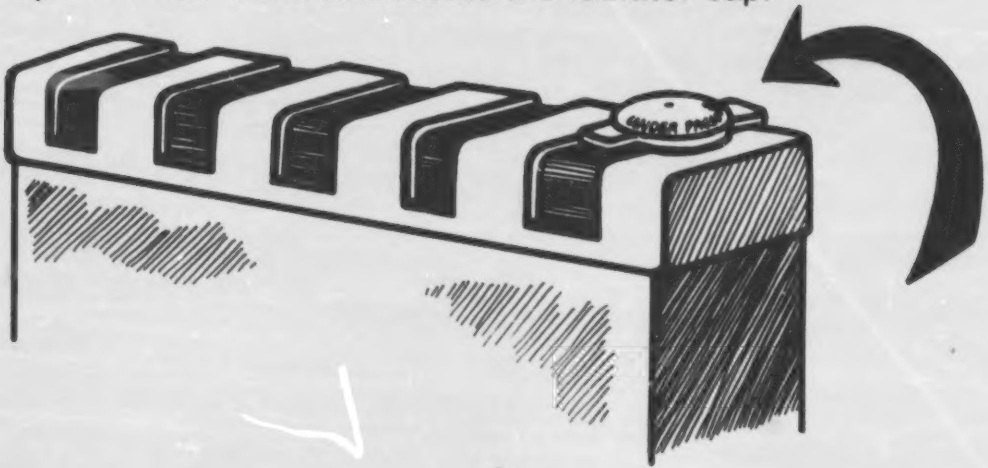


☐ **Pliers**

2. Wear proper safety equipment.

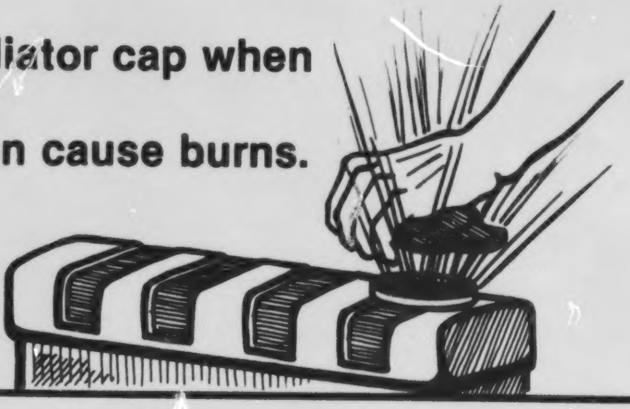


3. Open the car hood and locate the radiator cap.

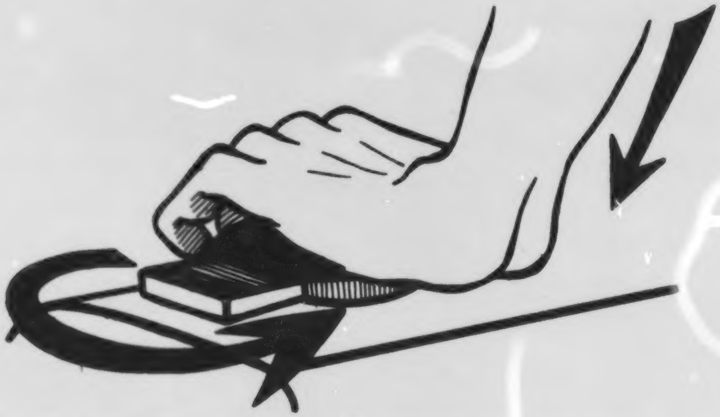


CAUTION!

NEVER remove radiator cap when engine is hot.
Escaping steam can cause burns.



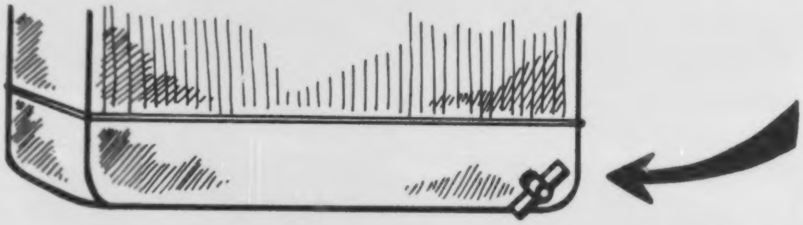
4. Push down firmly on the cap and turn it to the left and remove it.



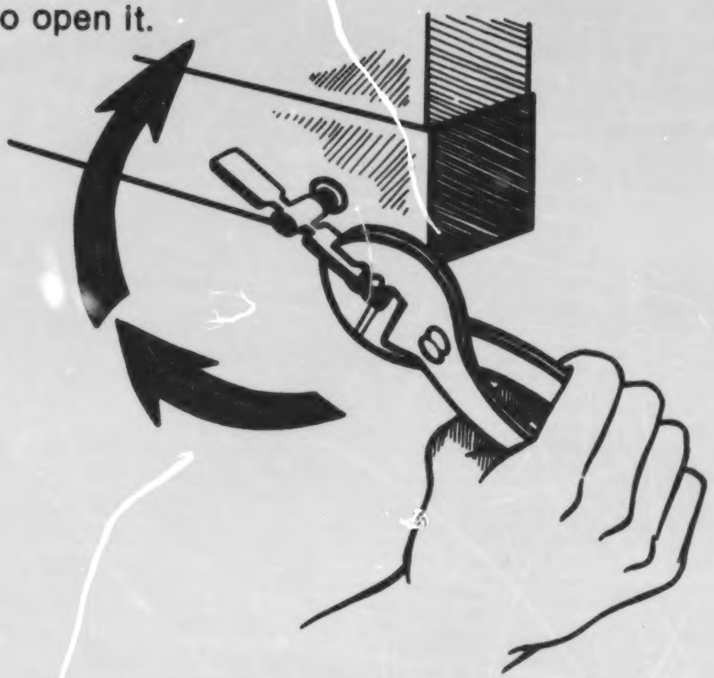
NOTE!

The radiator cap is under pressure and is sometimes difficult to turn.

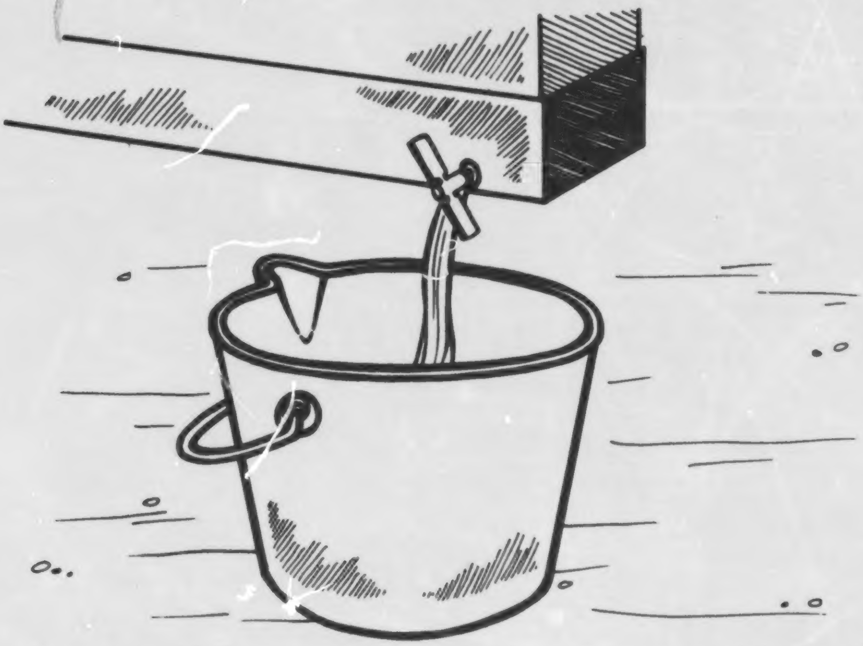
5. Locate the radiator petcock under the radiator.



6. Turn petcock to open it.



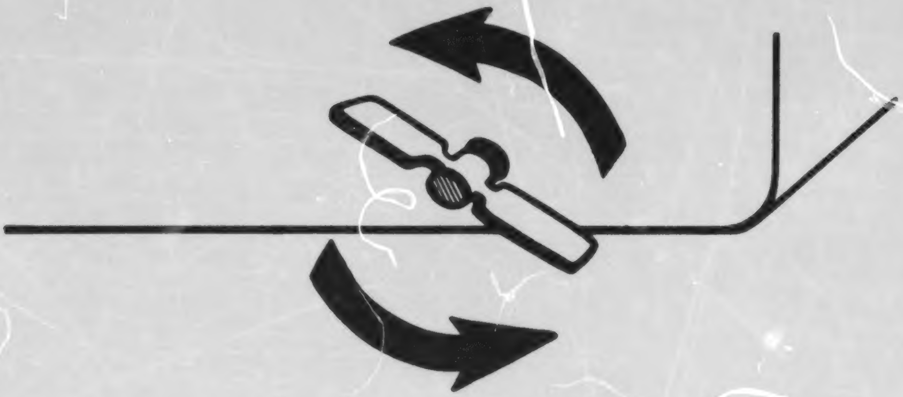
7. Drain old antifreeze into a bucket placed beneath the radiator.



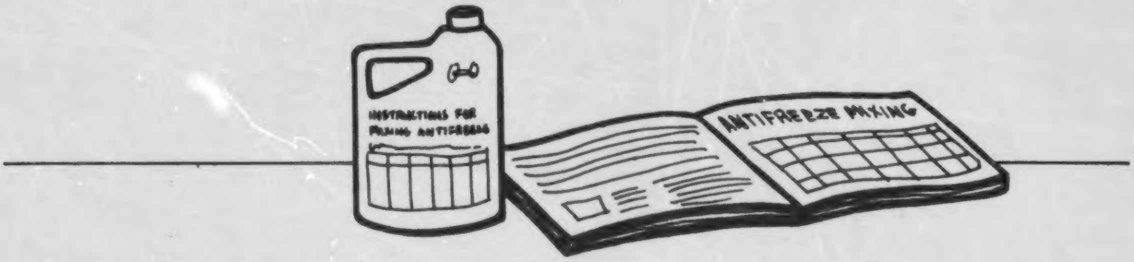
NOTE!

If antifreeze is very dirty you may have to flush the radiator with water before adding fresh antifreeze.

8. When the radiator is empty, tighten the petcock.

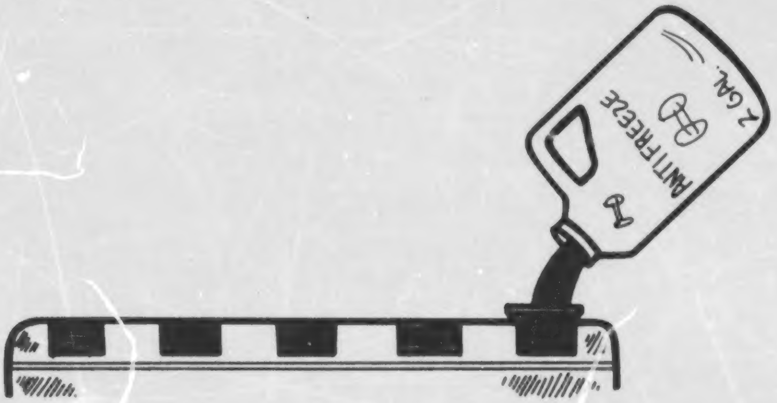


9. Refer to service manual or antifreeze container for instructions for mixing antifreeze.

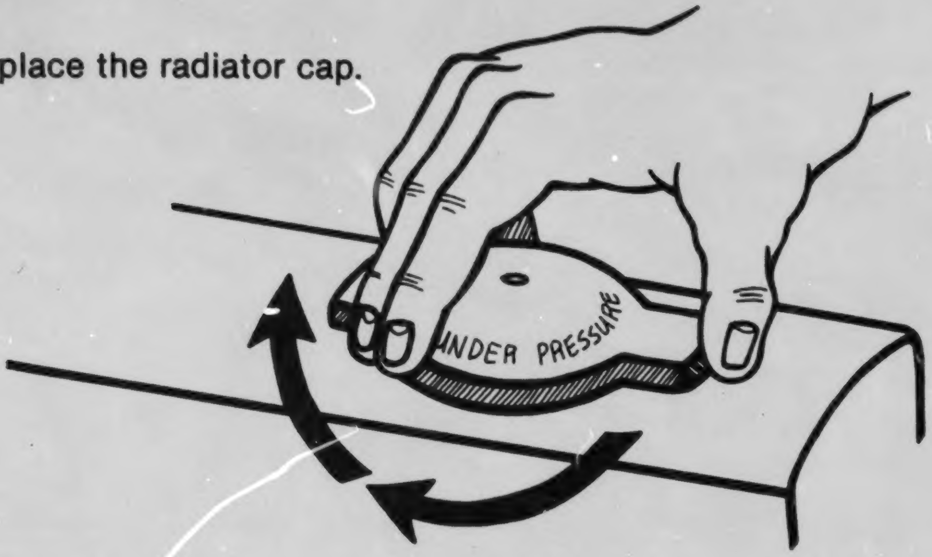

INSTRUCTIONS FOR MIXING ANTIFREEZE
ANTIFREEZE MIXING

Usually the mixture will be about 50 percent antifreeze and 50 percent water.

10. Prepare the antifreeze mixture. Pour it into the radiator. Completely fill radiator.


ANTIFREEZE
2 GAL.

11. Replace the radiator cap.

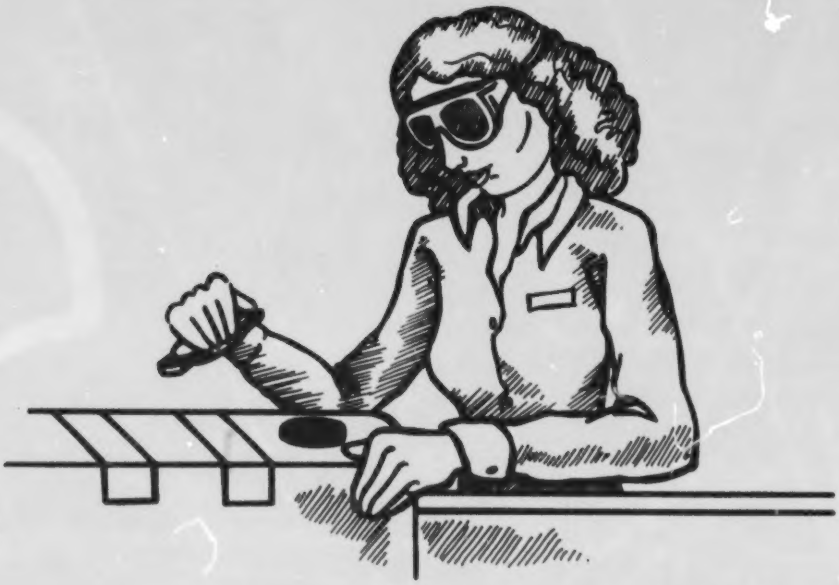


NOTE!

Install a new radiator cap if the rubber gasket is cracked or broken.

12. Start the car engine. Run it for 2 or 3 minutes. Shut engine off.

13. Remove radiator cap and check the level of antifreeze. You will probably need to add more antifreeze.



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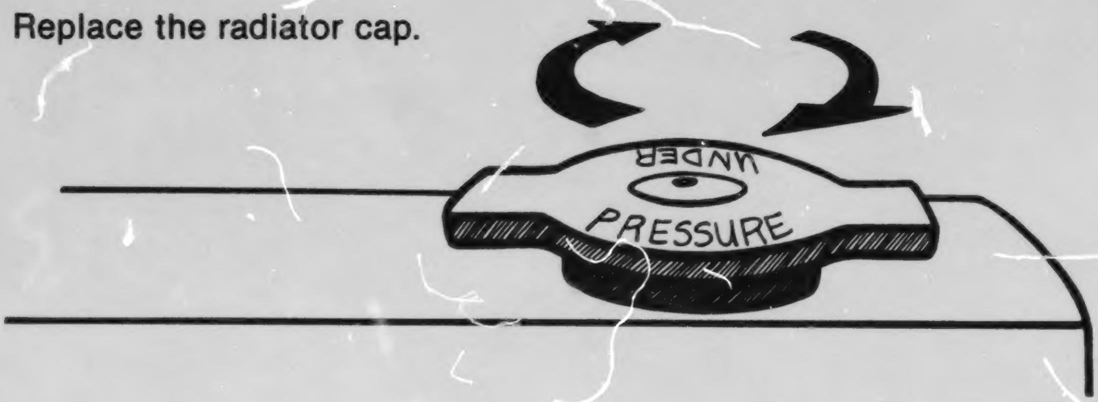
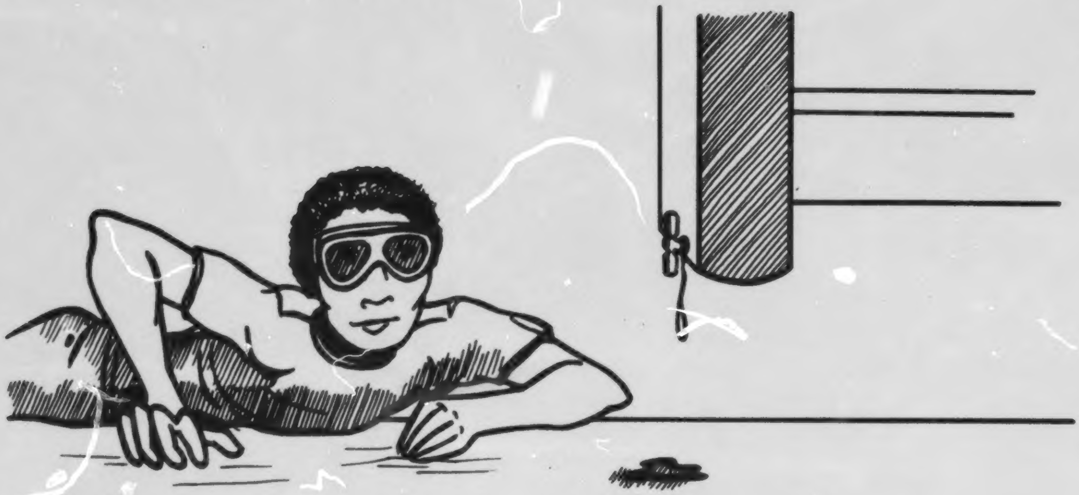
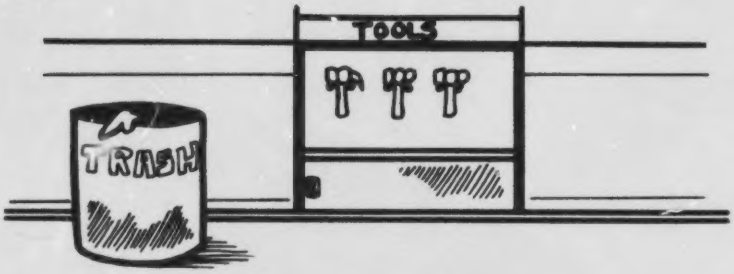
14. Replace the radiator cap.


UNDER
PRESSURE

15. Check radiator petcock for leaks.



16. Close the hood. Dispose of old antifreeze. Clean your work area and return tools to their proper places.


TOOLS
TRASH

SEE YOUR INSTRUCTOR

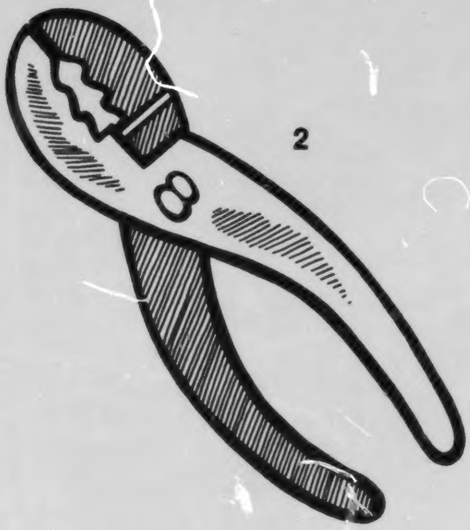
Unit 10
Installing Antifreeze in a Car

Tools and Materials identification Exercise

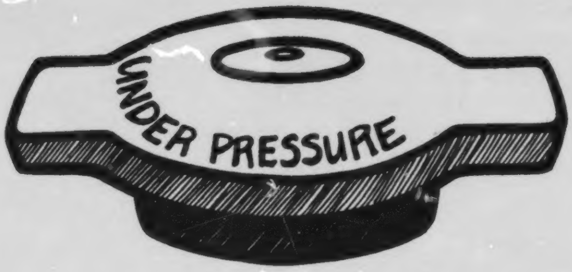
Match each object with its correct name.

_____ A. Bucket
_____ B. Antifreeze
_____ C. Pliers
_____ D. Radiator Cap

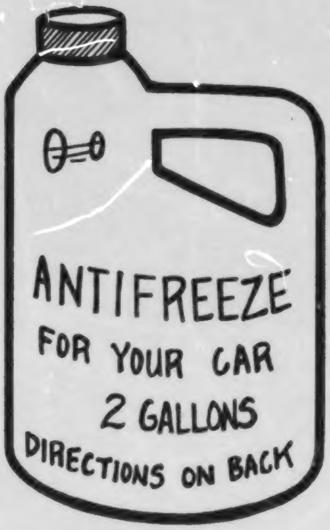
2



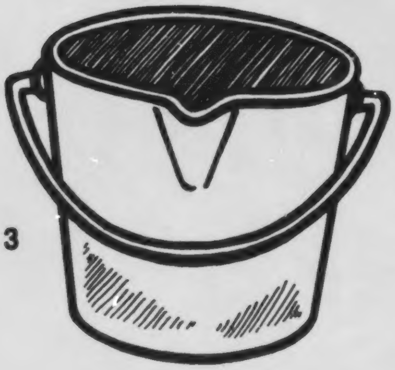
1


UNDER PRESSURE

4


ANTIFREEZE
FOR YOUR CAR
2 GALLONS
DIRECTIONS ON BACK

3



Unit 10
Installing Antifreeze in a Car

Practical Exercise Performance Checklist

The student ______________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified:			
a. Bucket			
b. Antifreeze			
c. Pliers			
2. Wore proper safety equipment.			
3. Opened hood, located and removed radiator cap.			
4. Located and opened radiator petcock.			
5. Drained old antifreeze.			
6. Closed petcock after antifreeze drained.			
7. Correctly prepared antifreeze mixture.			
8. Completely filled radiator with new antifreeze.			
9. Replaced radiator cap.			
10. Idled car and shut off engine to recheck level of antifreeze.			
11. Carefully removed radiator cap, added antifreeze if necessary.			
12. Replaced radiator cap and checked radiator petcock for leaks.			
13. Closed hood and disposed of old antifreeze.			
14. Cleaned work area and returned tools.			

Satisfactory Peformance ☐
Should Move On ☐
Repeat Exercise ☐

______________________ Instructor's Signature
__________ Date

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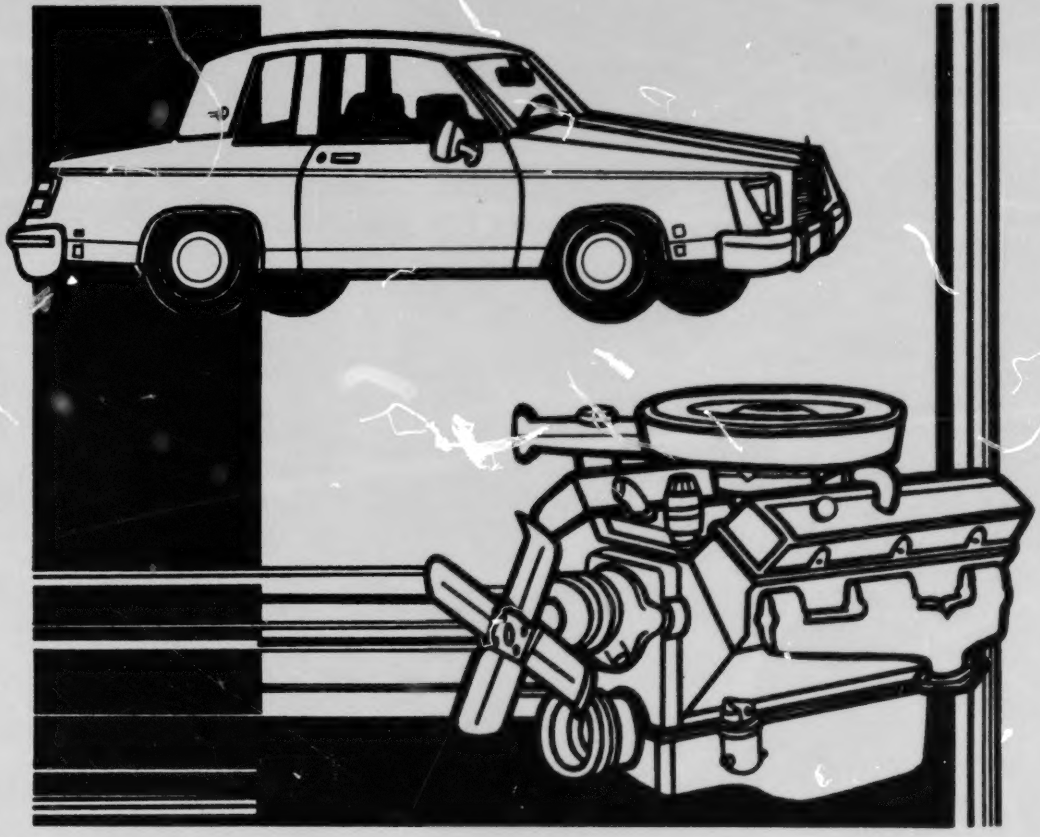
Vocational Preparation Curriculum
AUTO SERVICE



Unit 11

Replacing an Automotive Headlight

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION

iml

INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

Unit 11

Replacing an Automotive Headlight

Replacing an Automotive Headlight

After you study this lesson, you should be able to:

1. Identify tools, materials and equipment used to replace a headlight.
2. Correctly replace an automotive headlight.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

TURN THE PAGE AND BEGIN

Unit 11
Replacing an Automotive Headlight

Introduction

Automotive headlights burn out or get broken. When this happens these lights must be promptly replaced. As an auto service worker, you must know how to correctly replace these lights.

This unit will show you how to replace burned out headlights.

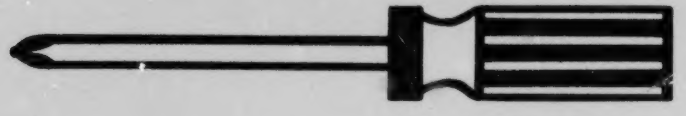
TURN TO NEXT PAGE

Unit 11

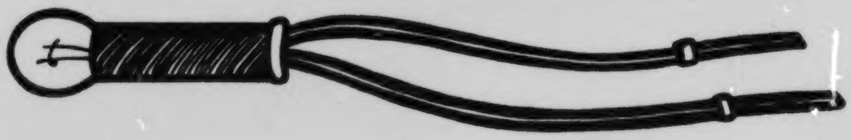
Replacing an Automotive Headlight

A. Tools, Materials and Equipment for Replacing an Automotive Headlight.

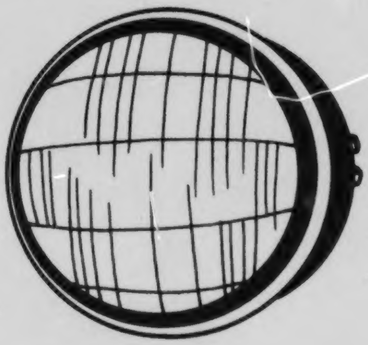
1. **PHILLIPS SCREWDRIVER:** Used to remove phillips screws from headlight assembly.



2. **TESTLIGHT:** Used to check for electric current in headlight connections.



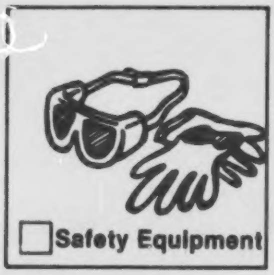
3. **SEALED BEAM HEADLIGHT:** Used to replace a burned out headlight.

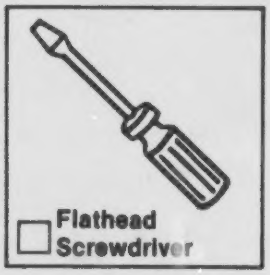


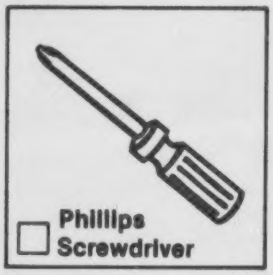
TURN TO NEXT PAGE

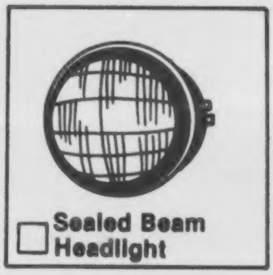
B. Steps for Replacing an Automotive Headlight.

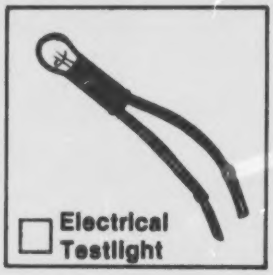
1. Find and Check Off the following:


☐ Safety Equipment

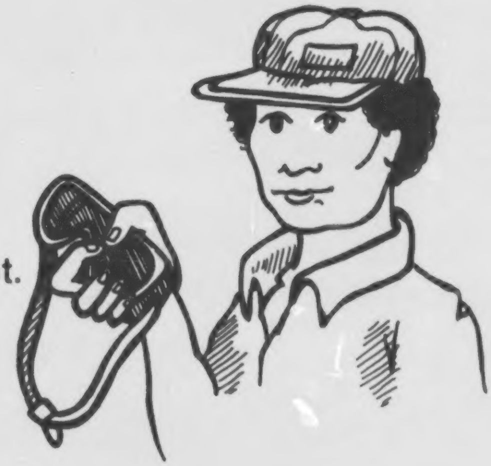

☐ Flathead Screwdriver


☐ Phillips Screwdriver

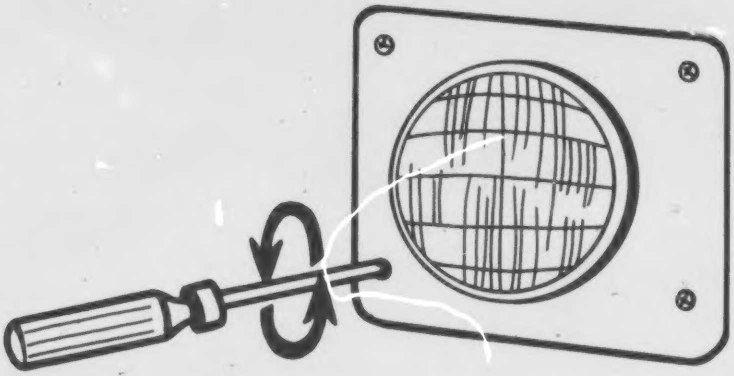

☐ Sealed Beam Headlight


☐ Electrical Testlight

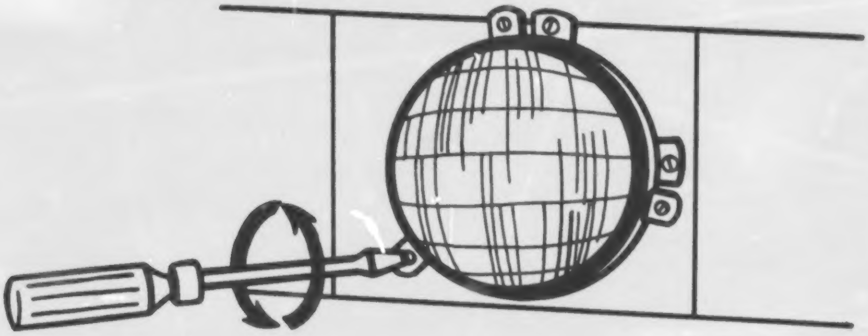
2. Wear proper safety equipment.



3. Remove screws that hold headlight frame in place.

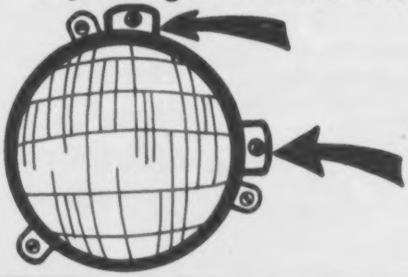


4. After headlight frame is removed, unscrew screws holding retainer ring to headlight body.

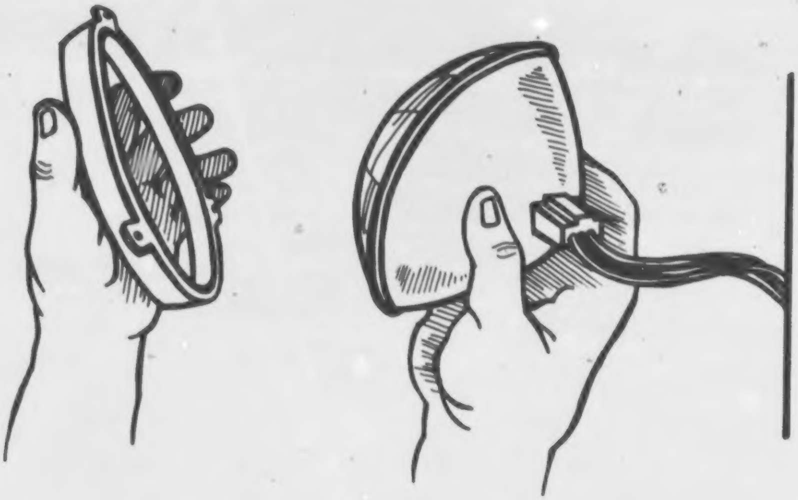


NOTE!

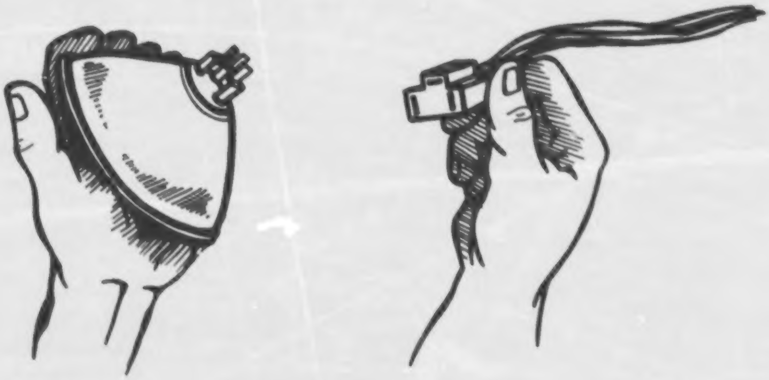
The other screws are light beam adjusting screws. Do not disturb them.



5. Remove the retainer ring.



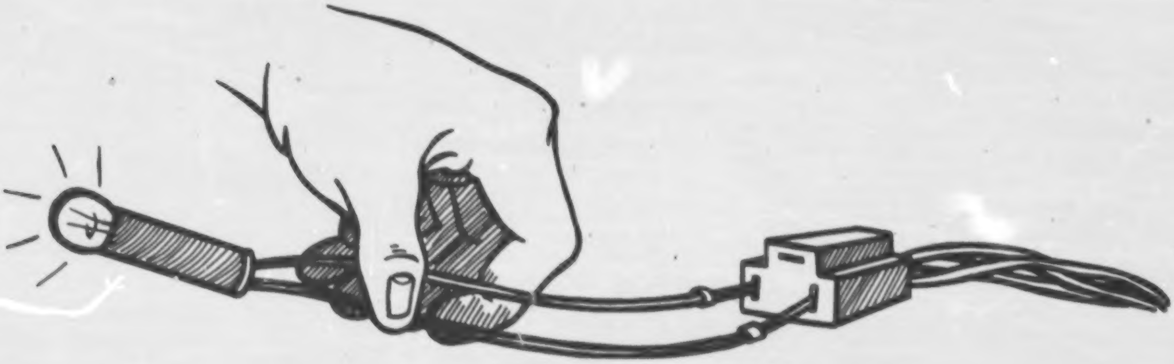
6. Pull the sealed beam unit forward and disconnect plug from headlight.



CAUTION!

If headlight is broken, be careful not to cut yourself.

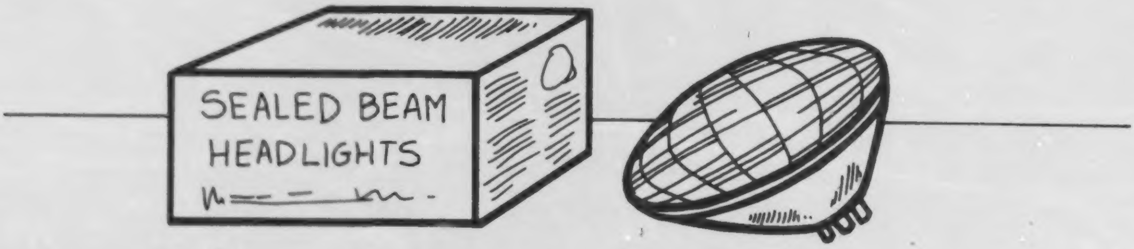
7. Insert testlight leads into socket connections. If connections are good the testlight will glow.



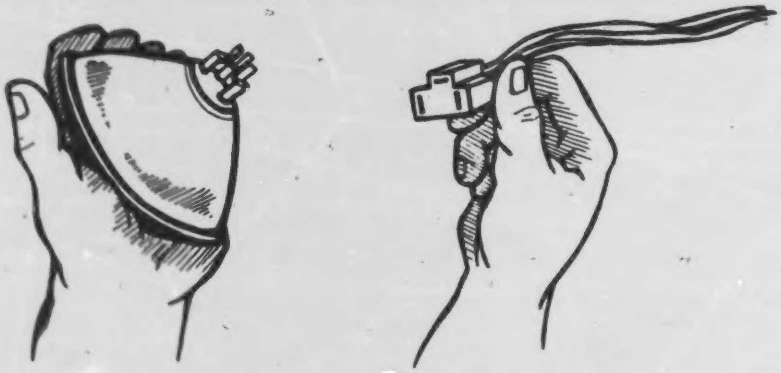
NOTE!

If it glows the sealed beam is not good and must be replaced. If the testlight does not glow, see your instructor.

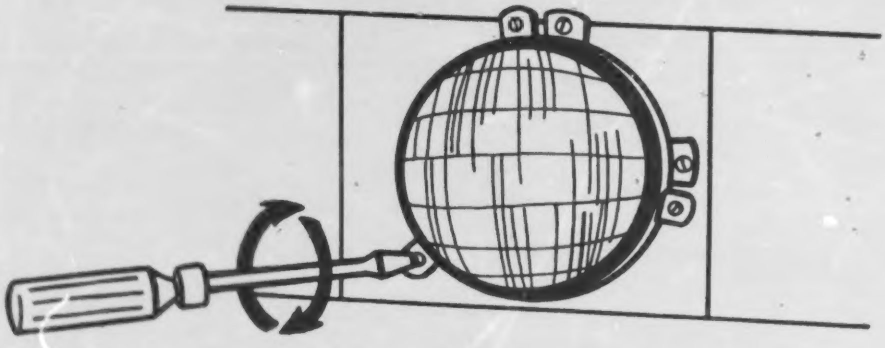
8. Obtain a new sealed beam headlight identical with the one you are replacing.



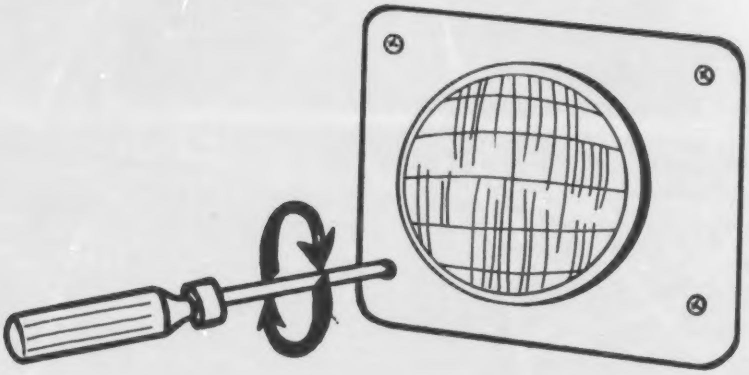
9. Plug the sealed beam into the headlight connection and adjust it to fit the indentations around socket.



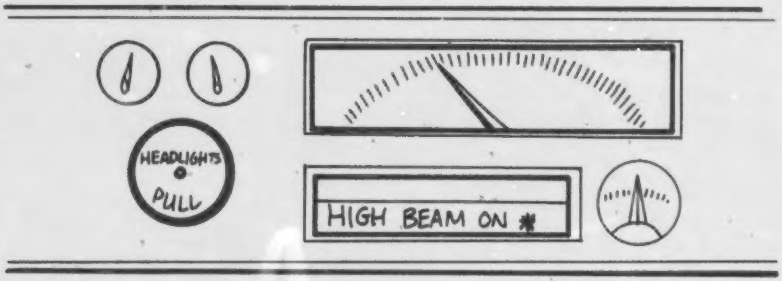
10. Replace retainer ring and screws.



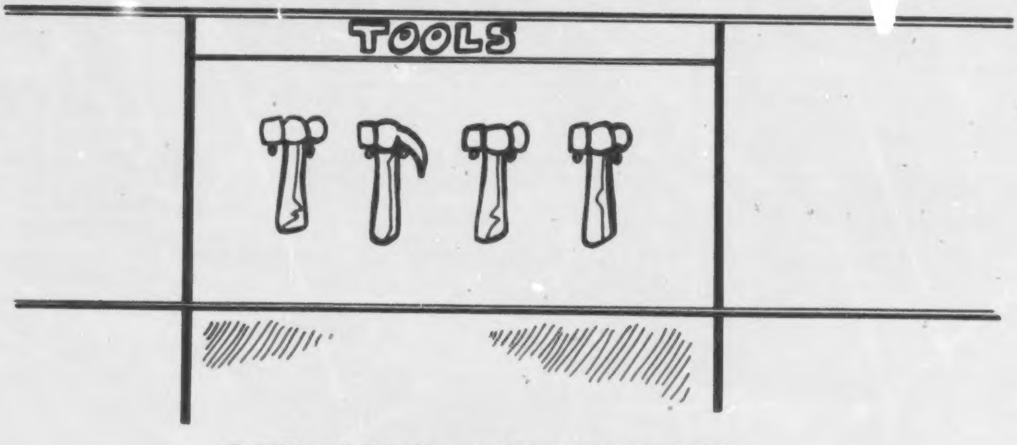
11. Replace headlight frame. Tighten screws.



12. Switch on headlights to check your work. Check high beam and low beam.


HEADLIGHTS
PULL
HIGH BEAM ON

13. Return tools to their proper places.



SEE YOUR INSTRUCTOR

Unit 11
Replacing an Automotive Headlight

Practical Exercise Performance Checklist

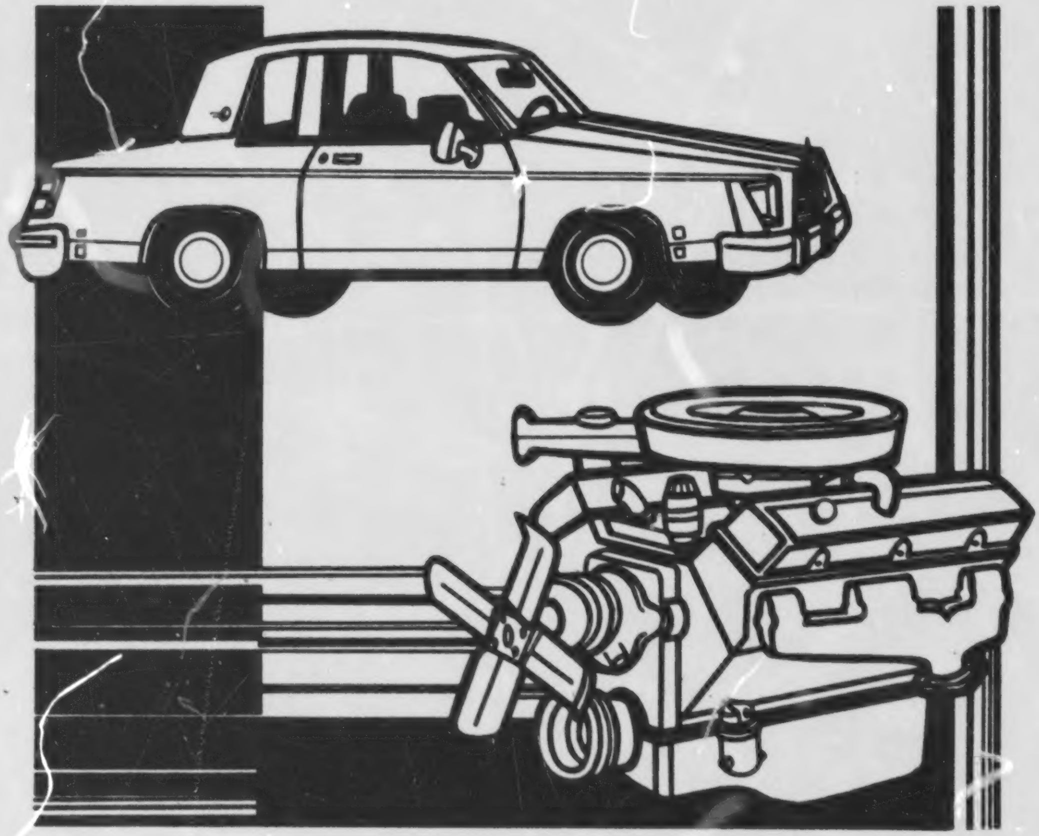
The student ______________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified			
a. Phillips screwdriver			
b. Testlight			
c. Sealed beam headlight			
2. Wore proper safety equipment.			
3. Correctly removed headlamp screws and headlamp frame.			
4. Removed retainer screws and retainer ring.			
5. Pulled sealed beam forward and disconnected plug.			
6. Used testlight to check socket.			
7. Obtained new sealed beam headlight.			
8. Plugged sealed beam into connection.			
9. Correctly inserted beam into headlight indentation.			
10. Replaced retainer ring and tightened screws.			
11. Replaced headlight frame and tightened screws.			
12. Switched on headlight and checked beams.			
13. Returned tools to proper places.			

Satisfactory Performance ☐
Should Move On ☐
Repeat Exercise ☐

______________________ Instructor's Signature
__________ Date

Vocational Preparation Curriculum
AUTO SERVICE



Unit 12

Replacing a Radiator Hose and Thermostat

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION

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INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI COLUMBIA

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Unit 12
Replacing a Radiator Hose and Thermostat

Replacing a Radiator Hose and Thermostat

After you study this lesson, you should be able to:

1. Identify tools and materials used to replace a radiator hose and thermostat.
2. Replace the upper radiator hose.
3. Replace the lower radiator hose.
4. Replace the thermostat.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

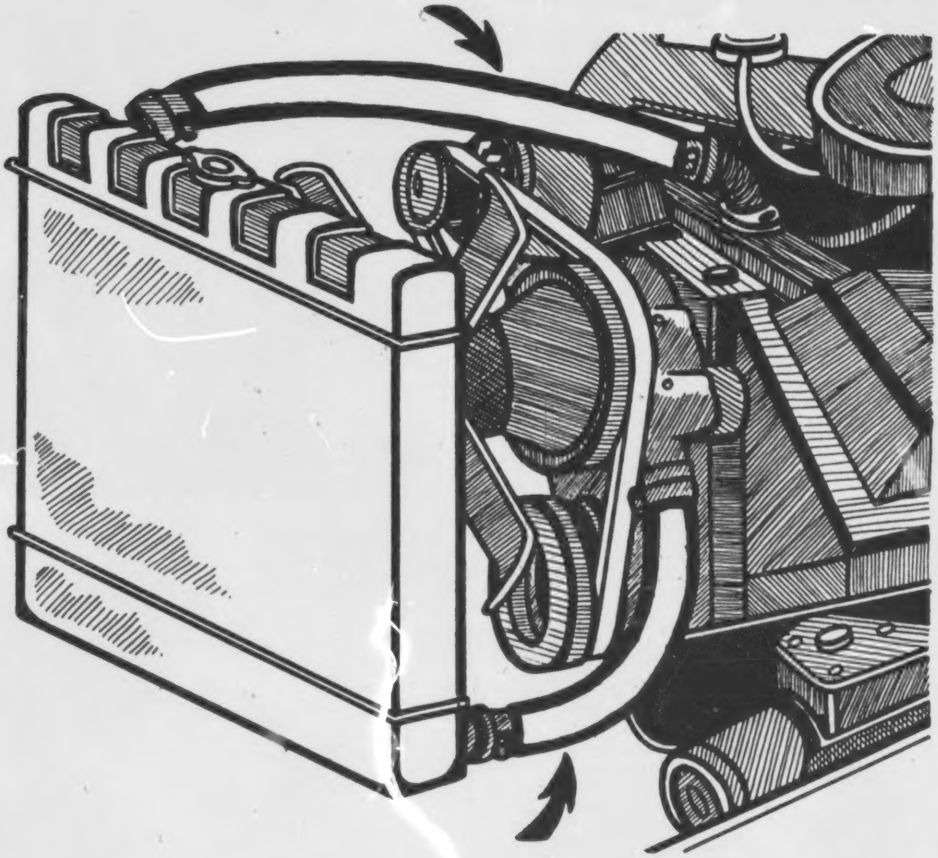
TURN THE PAGE AND BEGIN

Unit 12
Replacing a Radiator Hose and Thermostat

Introduction

Water cooled engines are cooled by a liquid coolant circulated through the engine from the radiator. The radiator is connected to the engine by two rubber hoses. A thermostat controls the temperature of the liquid coolant.
If the hoses or thermostat go bad a car can easily overheat.

In this unit you will learn how to replace a thermostat and radiator hoses.

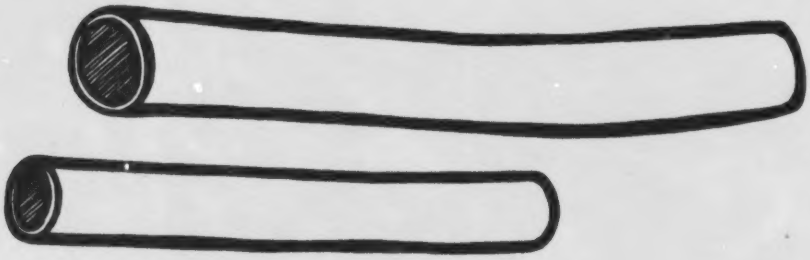


TURN TO NEXT PAGE

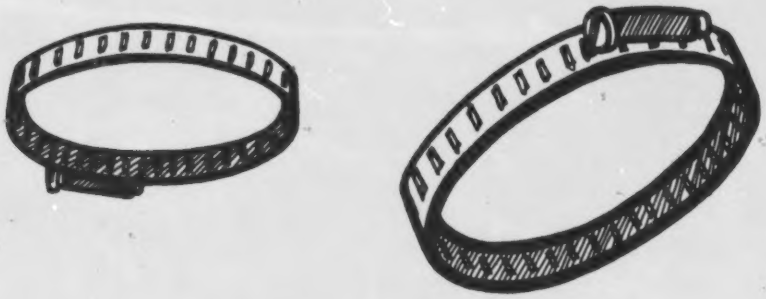
Unit 12
Replacing a Radiator Hose and Thermostat

A. Tools, Materials and Equipment for Replacing a Radiator Hose and Thermostat.

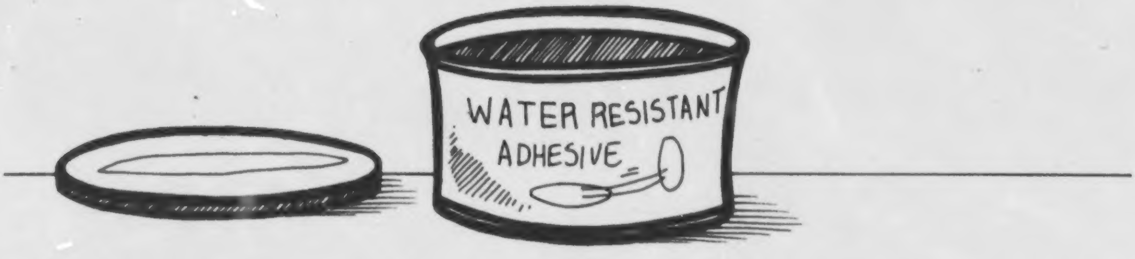
1. **RADIATOR HOSES:** Used to replace the worn or cracked hoses.



2. **HOSE CLAMPS:** Used to attach the hose ends to the radiator and engine block.



3. **WATER RESISTANT ADHESIVE:** Used to coat metal surfaces where radiator hoses are attached.



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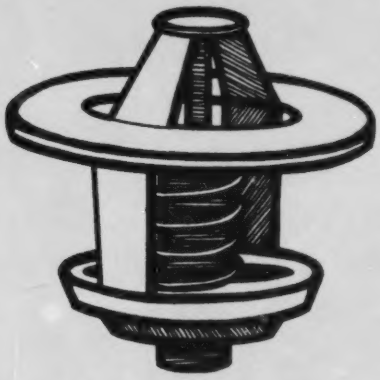
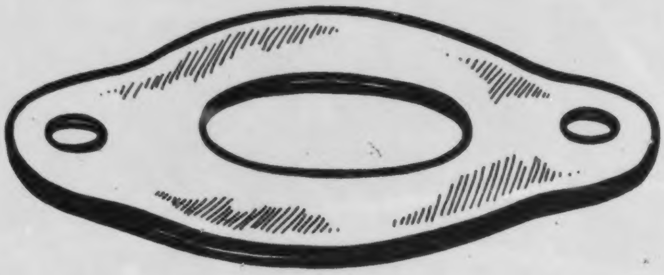
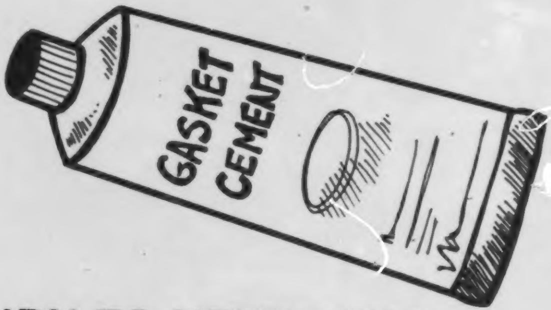
4. **THERMOSTAT:** Device which controls liquid coolant temperature as coolant circulates through radiator and engine.



5. **THERMOSTAT GASKET:** A seal used to prevent coolant leaks around the thermostat housing.



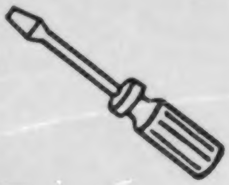
6. **GASKET CEMENT:** Used to seal the thermostat housing and prevent leaks around the gasket.

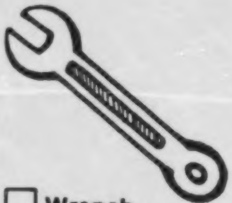


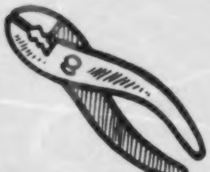
TURN TO NEXT PAGE

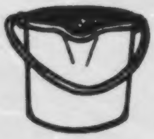
B. Steps for Removing a Radiator Hose.

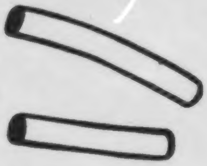
1. Find and Check Off the following:

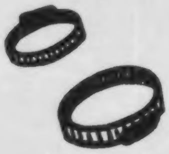

☐ Screwdriver

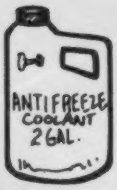

☐ Wrench

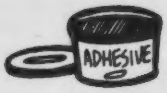

☐ Pliers


☐ Plastic Container

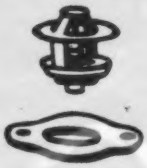

☐ Radiator Hoses

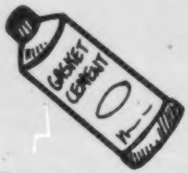

☐ Clamps

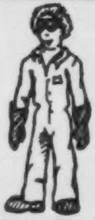

ANTIFREEZE
COOLANT
2GAL.
☐ Antifreeze Coolant



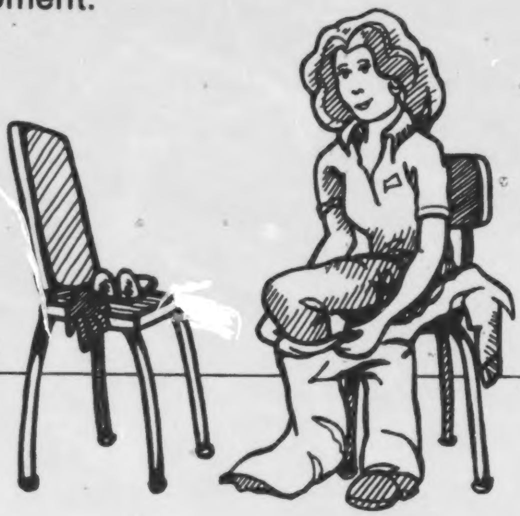
☐ Water Resistant Adhesive


☐ Thermostat and Gasket

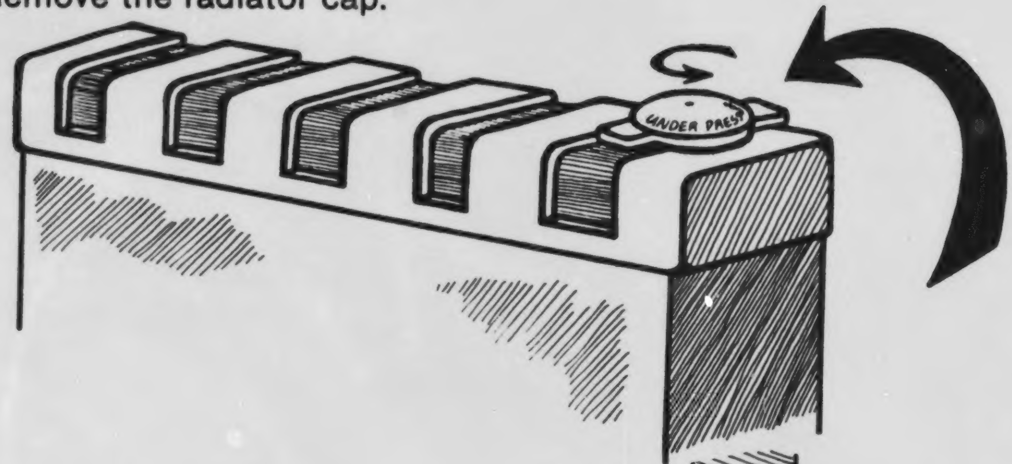

GASKET CEMENT
☐ Gasket Cement

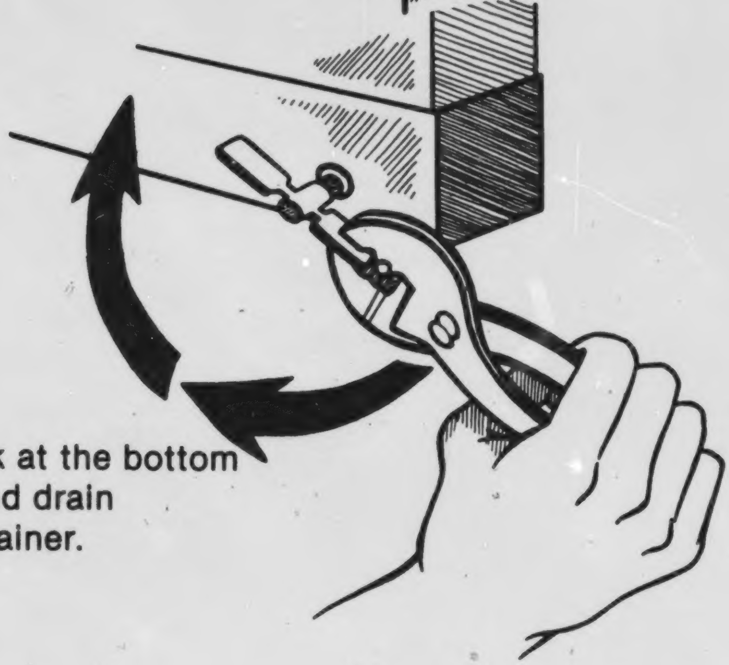

☐ Safety Equipment

2. Wear proper safety equipment.



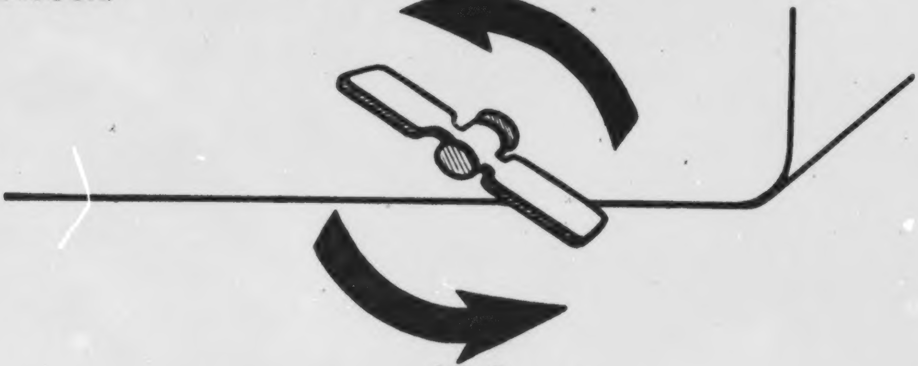
3. Remove the radiator cap.



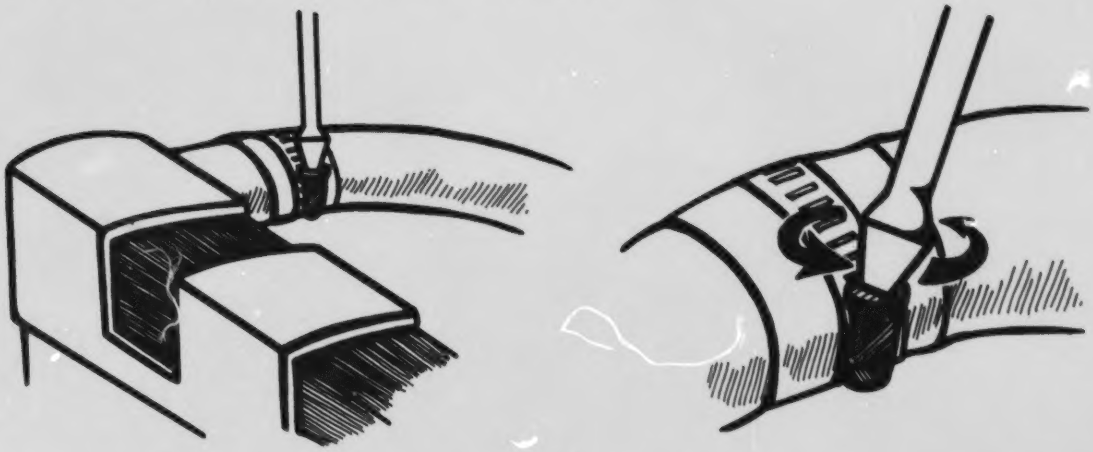


Open the petcock at the bottom of the radiator and drain coolant into container.

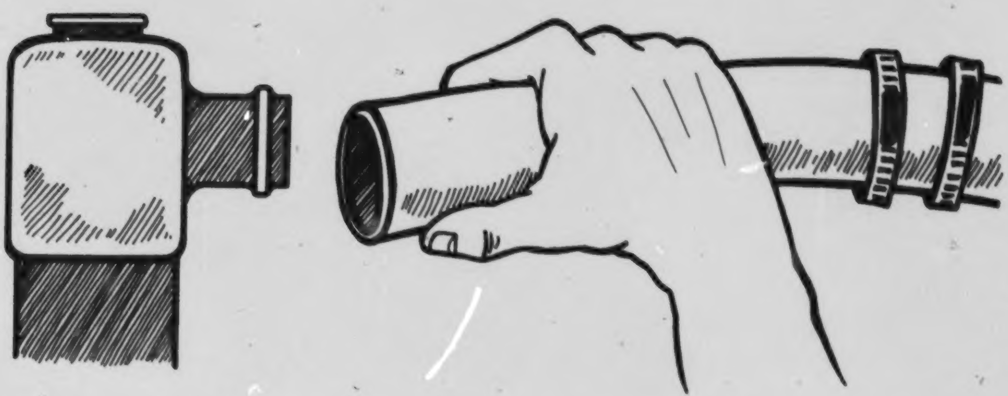
4. Allow coolant to completely drain then tighten the radiator petcock.



5. Loosen clamp screws at the ends of upper hose. Turn screws to the left until ring is loose on hose.

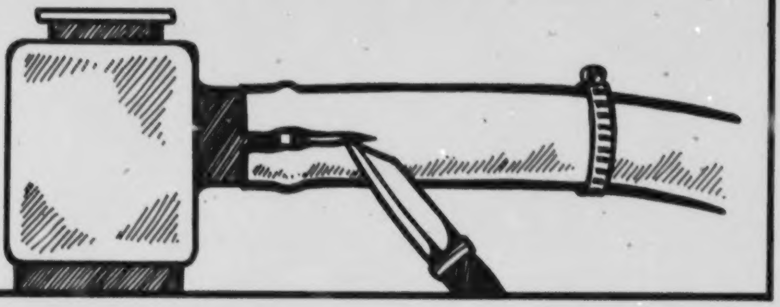


6. Twist and remove hose from metal connecting joints.

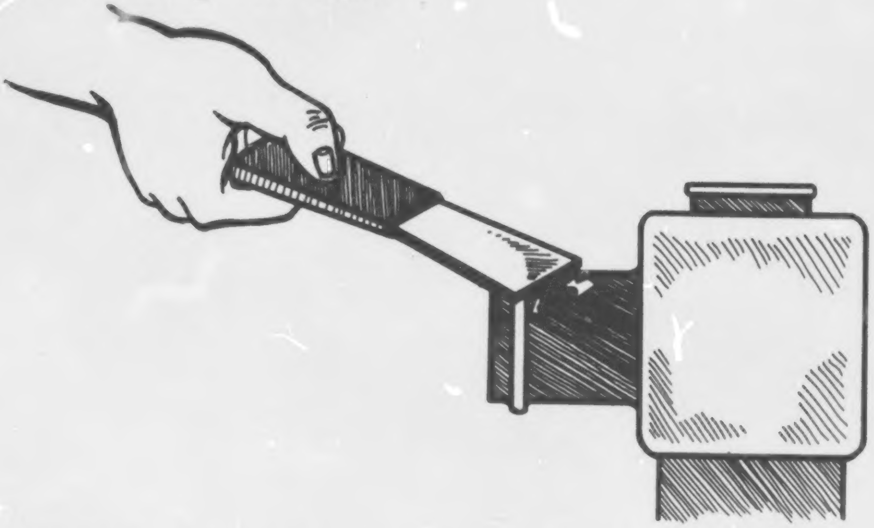


NOTE!

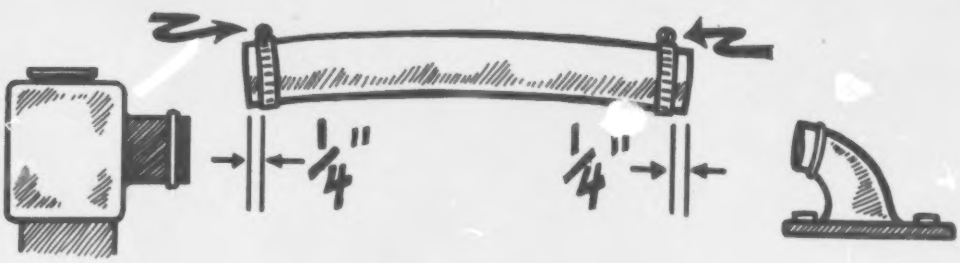
NEVER force the hose if it sticks you may break the connecting joint. Split the end of hose then remove it.



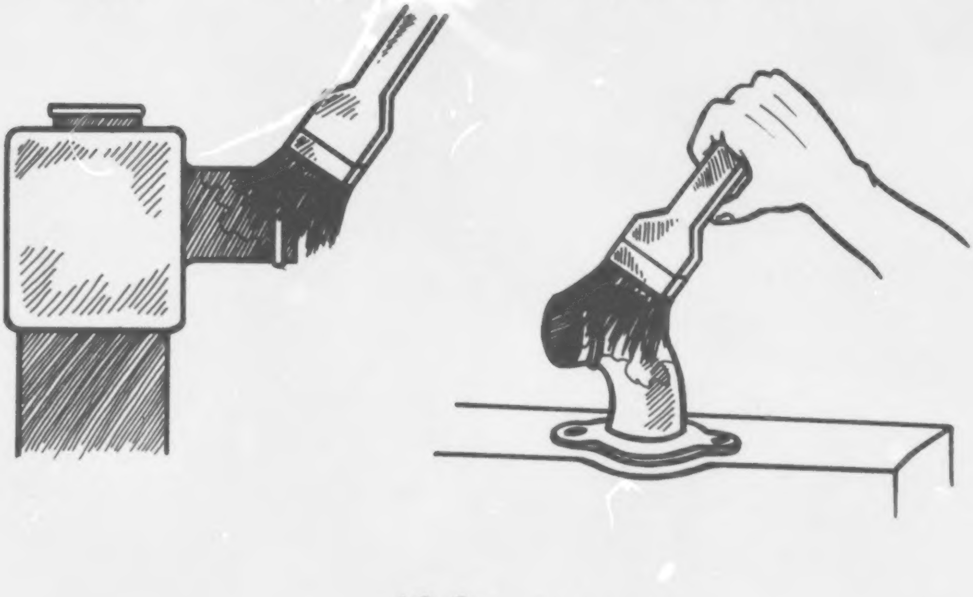
7. Clean off any bits of old hose from metal joints before attaching new hose.



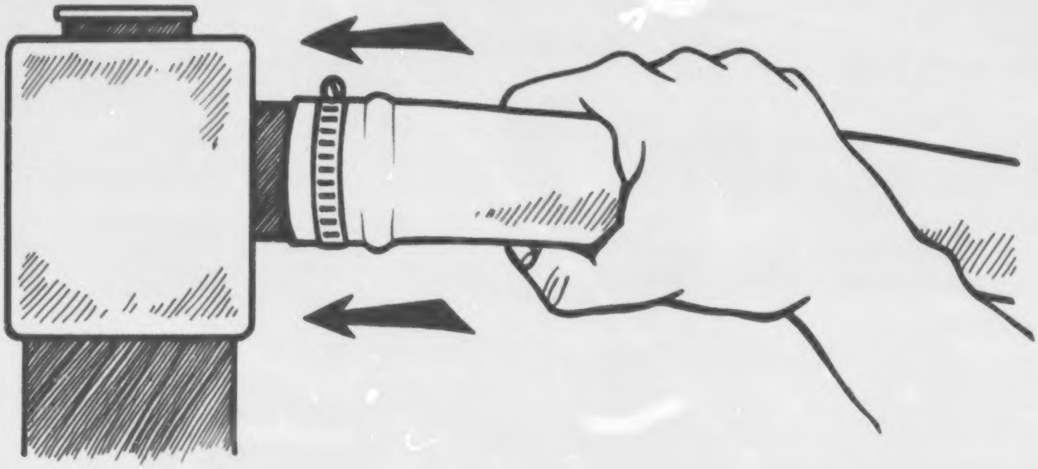
8. Fit radiator clamps onto the new hose about 1/4" from each end.



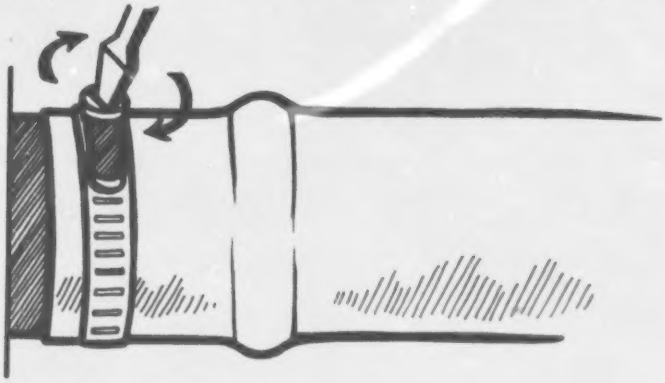
9. Apply a thin coating of water-resistant adhesive to the metal connecting joints on the radiator and engine block.



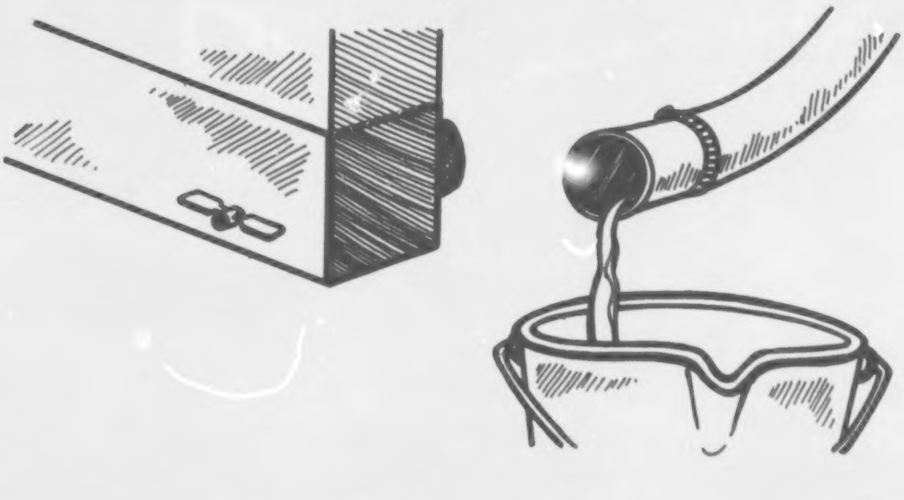
10. Install new hose over connecting joint to the point where clamp slides past joint ridge.



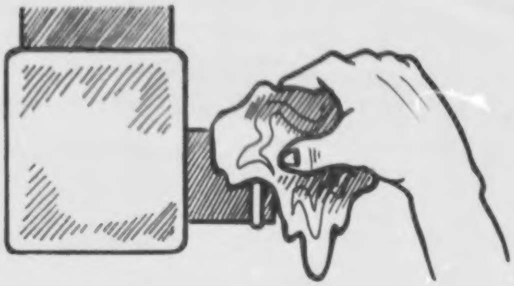
11. Tighten each clamp screw when the hose clamp is in place.



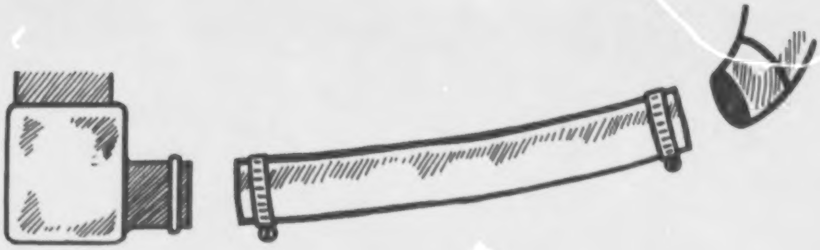
12. Remove lower radiator hose. Drain coolant into container.



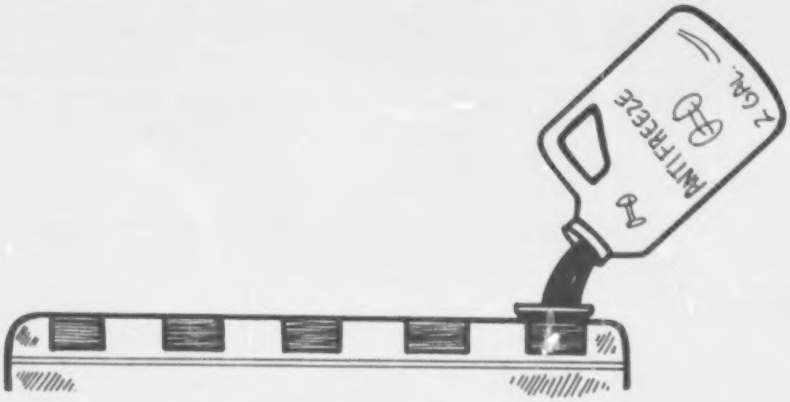
13. Clean the metal joint surface.



14. Fit radiator clamps onto hose and install hose over connecting joints. Tighten hose clamps.



15. Pour coolant back into radiator. Check hose clamps for leaks.

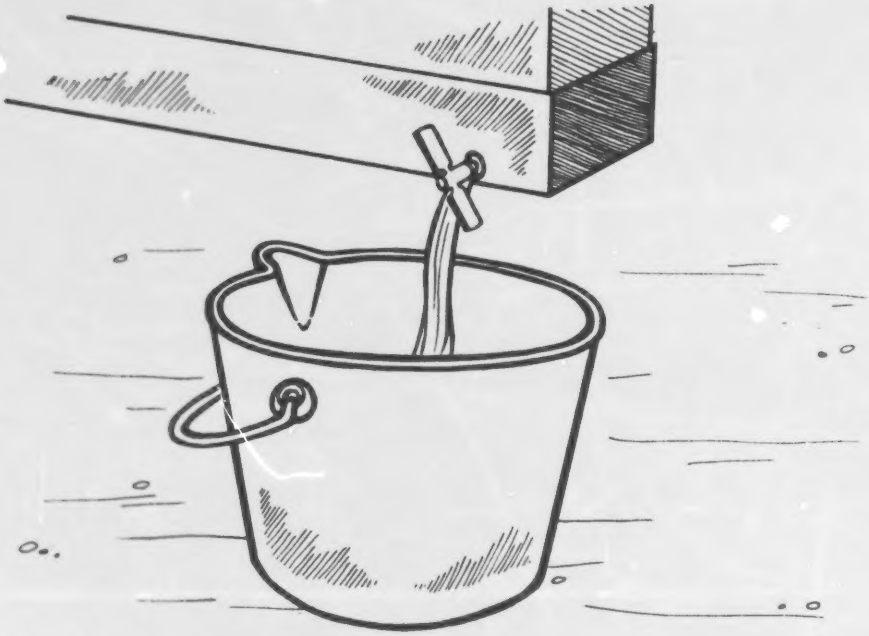


16. Check the petcock for leaks. Replace the radiator cap.

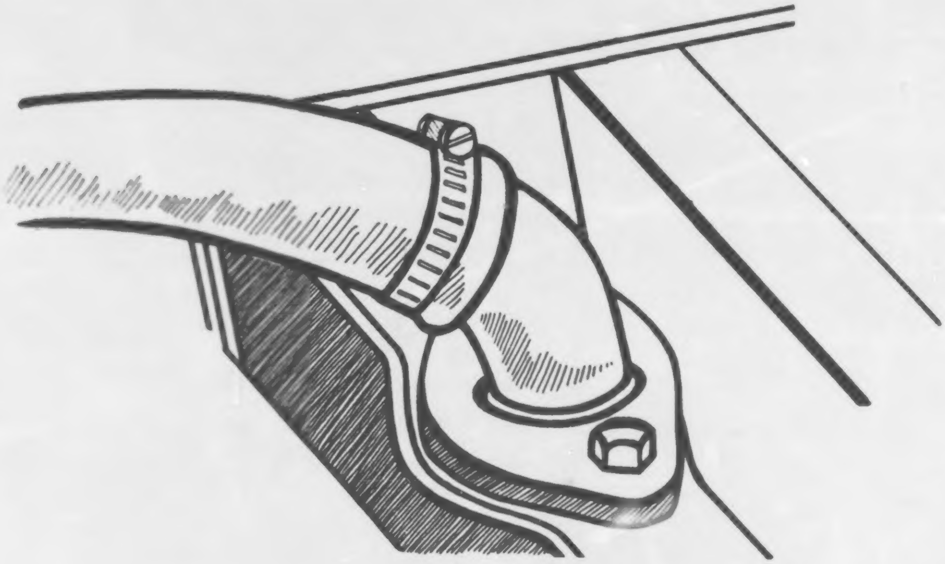
TURN TO NEXT PAGE

C. Steps for Replacing a Thermostat.

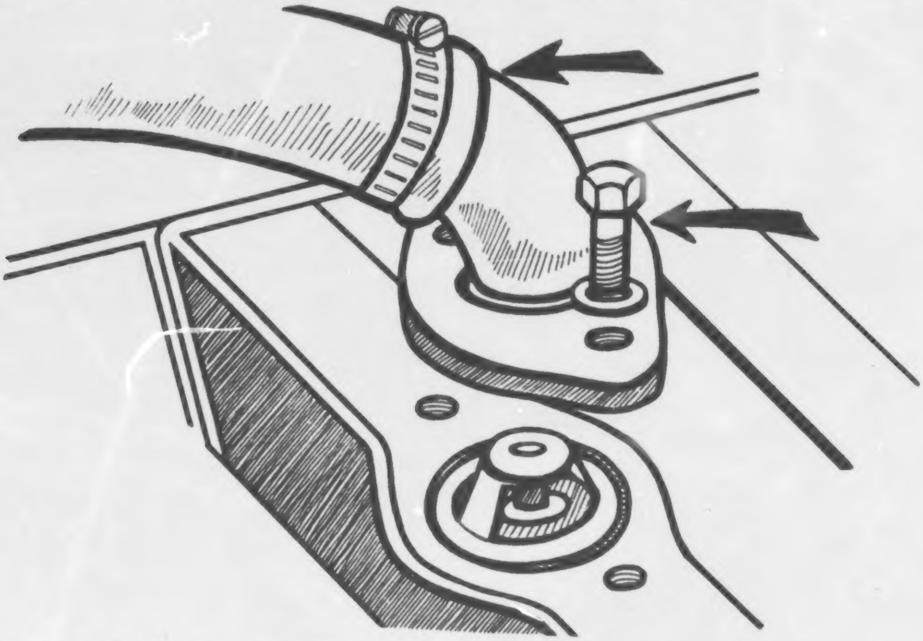
17. Loosen the petcock and drain about two quarts of coolant into a container. Retighten the petcock.



18. Locate the thermostat housing. This is usually where the upper radiator hose is attached to the engine block.



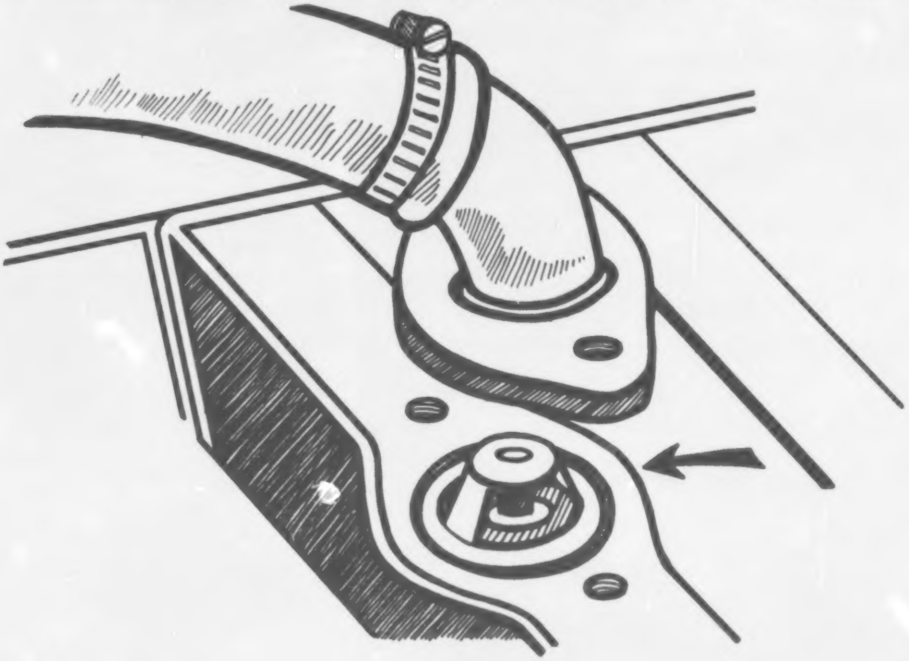
19. Remove bolts that hold thermostat housing to engine block.



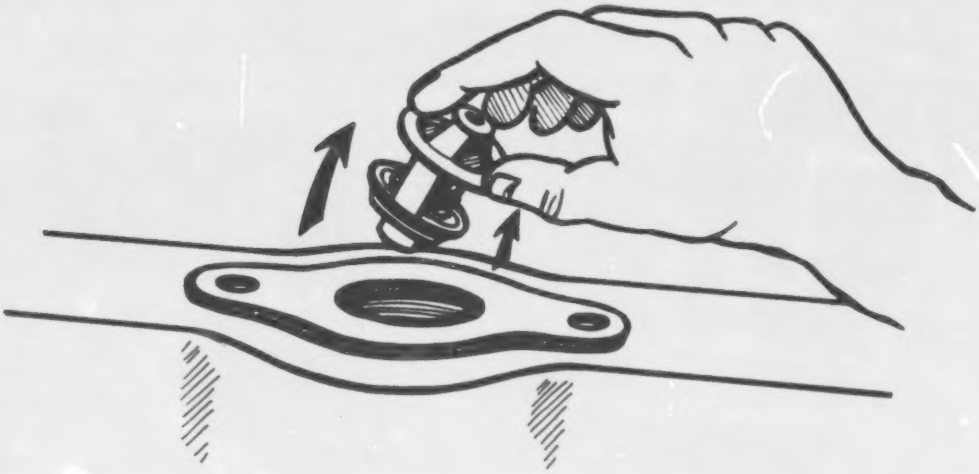
NOTE!

The radiator hose does not have to be removed to replace the thermostat.

20. Lift the thermostat housing and expose the thermostat.

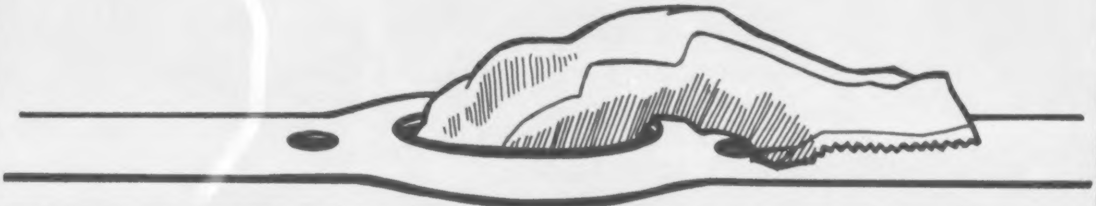


21. Lift out thermostat and remove the old gasket.

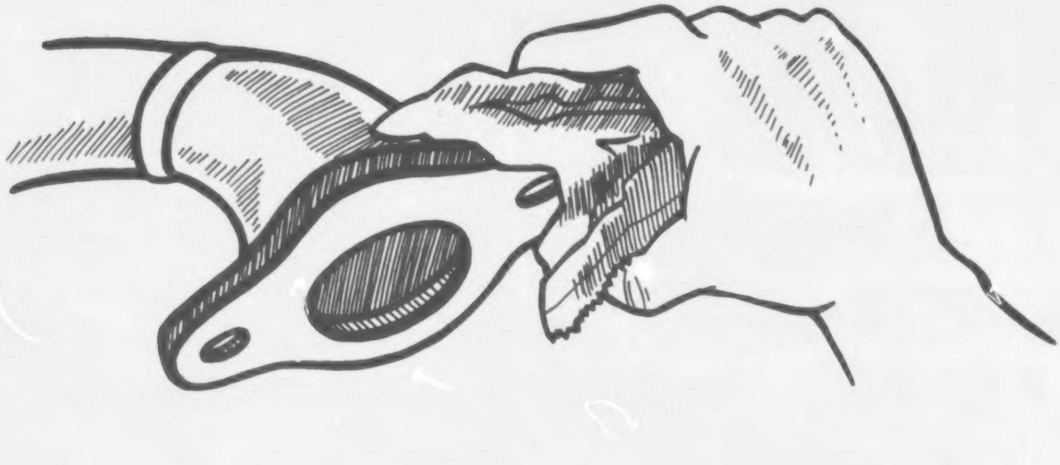


NOTE!

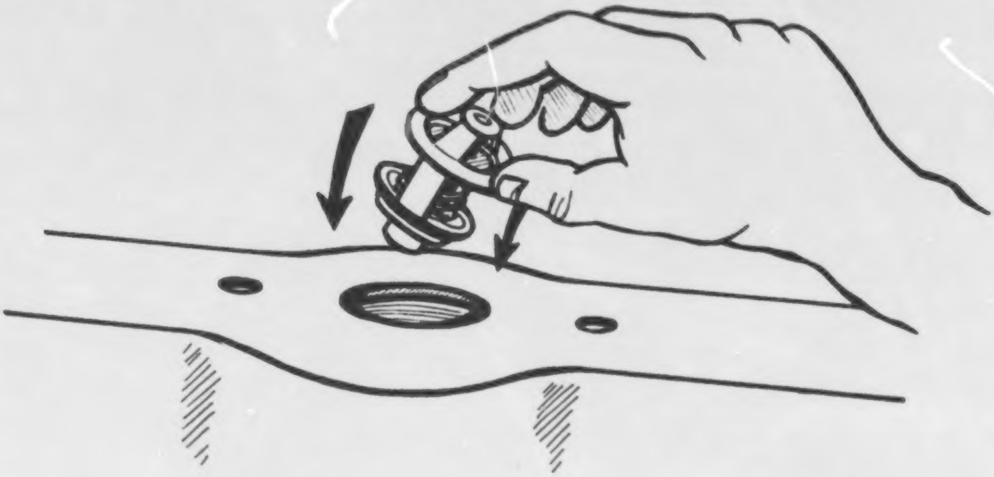
Place a shop towel into exposed hole to keep dirt out.



22. Clean exposed surfaces of the thermostat housing.

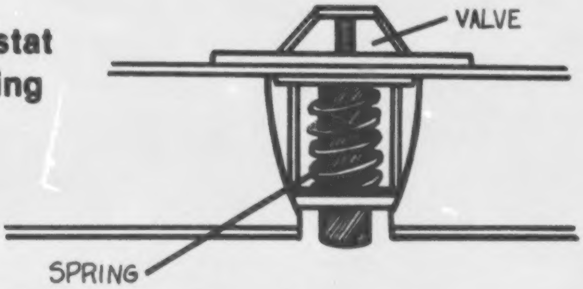


23. Place the new thermostat in the thermostat housing.

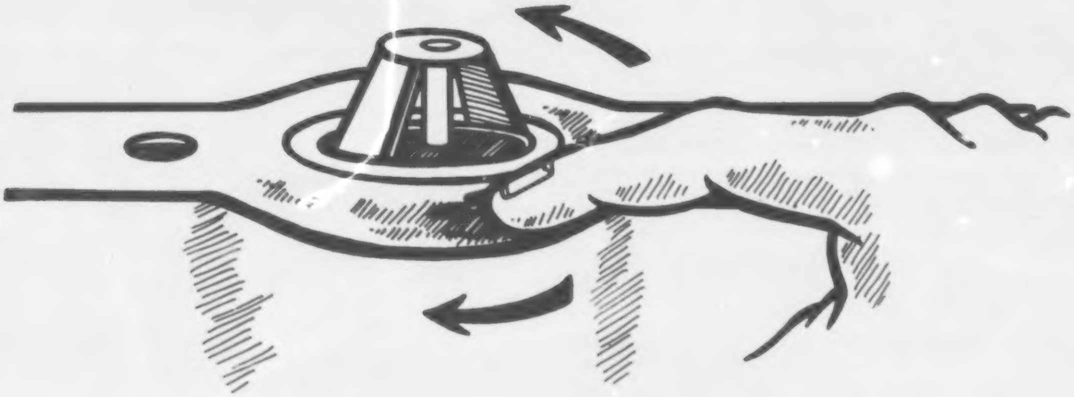


NOTE!

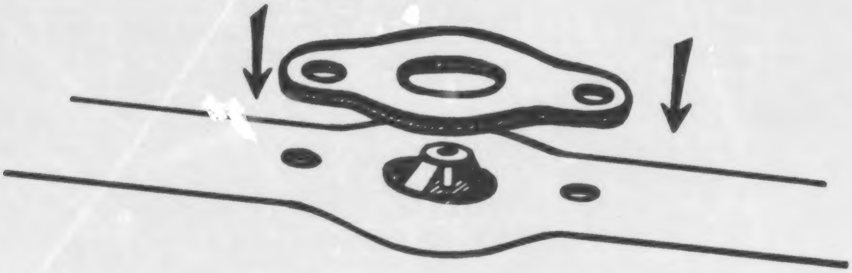
Always install the thermostat with valve end up and spring end down.



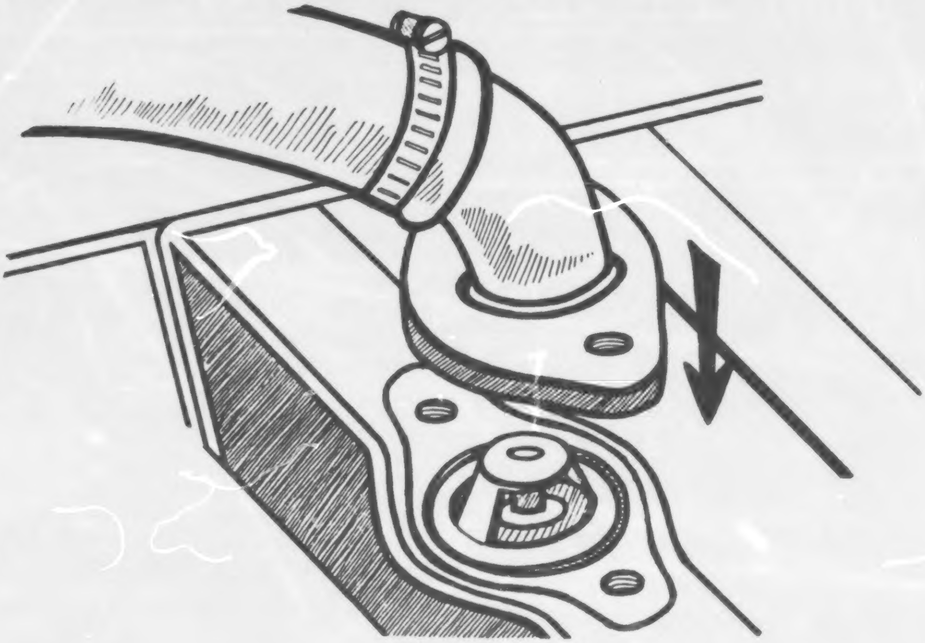
24. Apply gasket cement to the thermostat housing base surface.



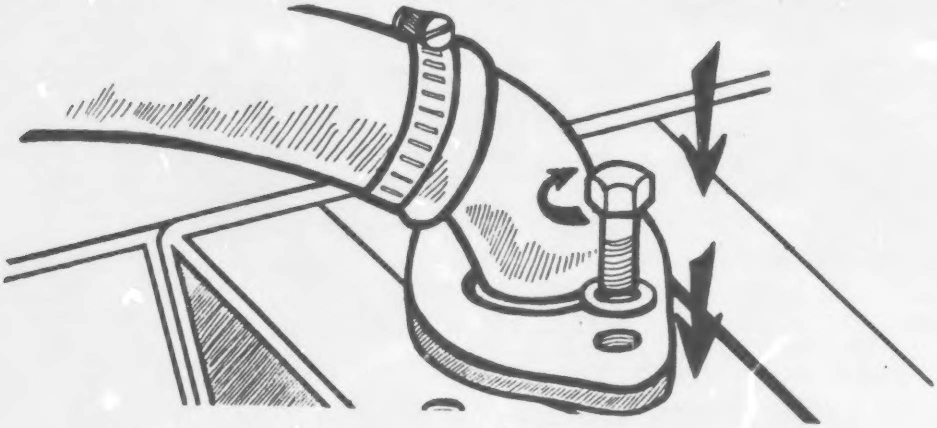
25. Place new thermostat gasket in position.



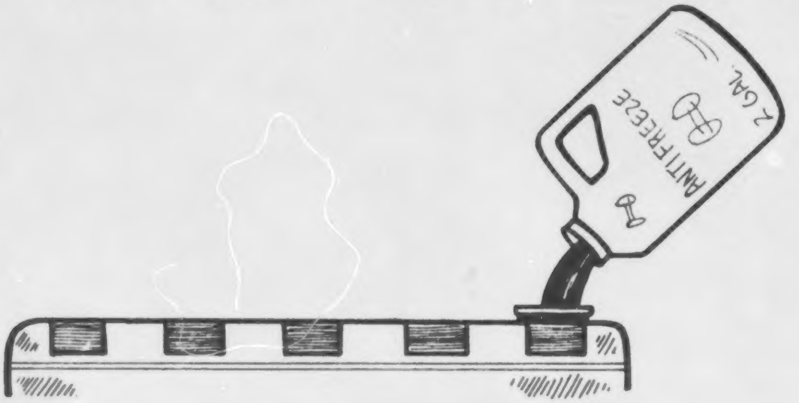
26. Carefully set the upper housing in place.

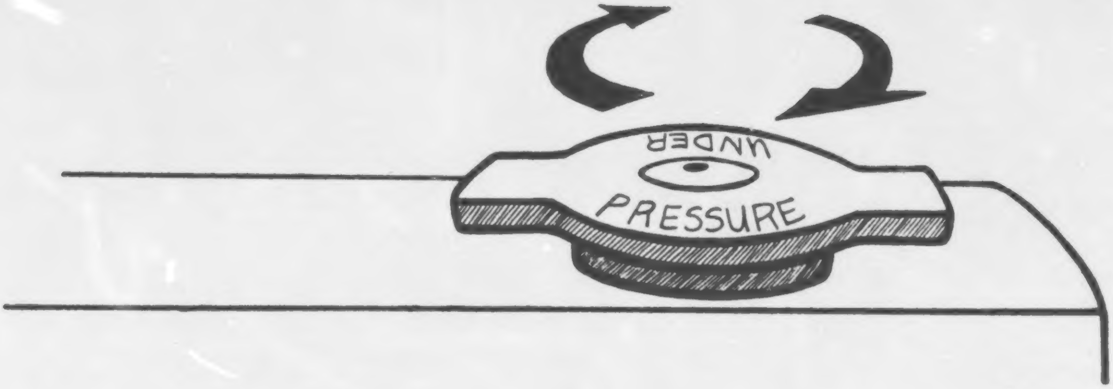


27. Insert the bolts and tighten by turning them to the right.

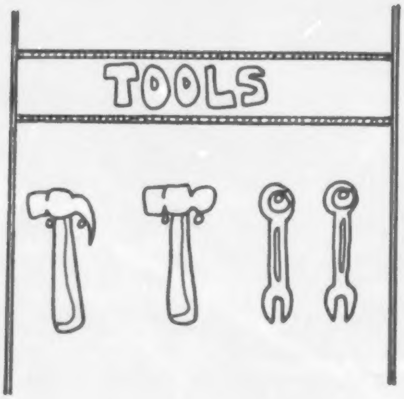


28. Refill radiator with coolant and replace radiator cap securely.


2 GAL.
ANTIFREEZE


UNDER
PRESSURE

29. Return tools to their proper places. Clean your work area.



SAFETY GOGGLES
TRASH

SEE YOUR INSTRUCTOR

Unit 12
Replacing a Radiator Hose and Thermostat

Practical Exercise Performance Checklist

The student ______________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified:			
a. Radiator hose			
b. Hose clamps			
c. Thermostat			
d. Thermostat gasket			
e. Ge[illegible]			
2. Wore proper sa[illegible]uipment.			
Replacing radiator hoses			
3. Removed radiator cap.			
4. Opened petcock and drained coolant into bucket.			
5. Tightened radiator petcock.			
6. Loosened clamp screws and removed upper radiator hose.			
7. Cleaned off bits of old hose from connecting joints.			
8. Correctly fitted clamps onto new hose.			
9. Applied water-resistant adhesive to metal connecting joints.			
10. Correctly installed new upper radiator hose and tightened clamp screw.			
11. Correctly removed lower radiator hose and drained coolant.			
12. Cleaned metal joints.			

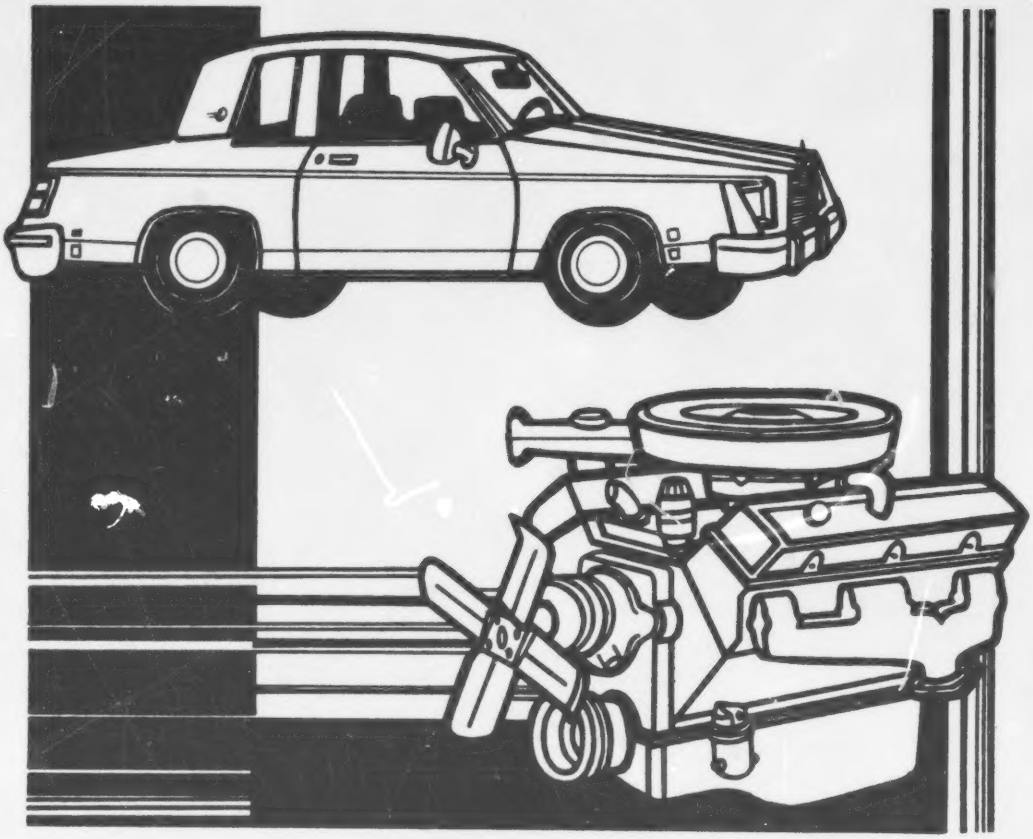
Tasks	Yes	No	Comments
13. Correctly installed lower radiator hose.			
14. Filled the radiator with coolant.			
15. Checked the hose connectors for leaks.			
16. Checked petcock for leaks and replaced radiator cap.			
Replacing a thermostat			
17. Drained two quarts of coolant from radiator and tightened petcock.			
18. Located thermostat housing.			
19. Removed bolts holding thermostat housing to engine block.			
20. Lifted thermostat housing to expose the thermostat.			
21. Lifted up thermostat and discarded old gasket.			
22. Cleaned exposed surfaces of thermostat housing.			
23. Correctly placed new thermostat in housing.			
24. Applied gasket cement to the surface of thermostat housing base.			
25. Placed new gasket in place.			
26. Carefully set upper housing in place.			
27. Attached housing to engine block.			
28. Refilled radiator with coolant and replaced radiator cap.			
29. Returned tools to their proper places and cleaned work area.			

Satisfactory Performance ☐
Should Move On ☐
Repeat Exercise ☐

Instructor's Signature

Date

Vocational Preparation Curriculum
AUTO SERVICE



Unit 13

Replacing Fuses in an Automobile

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION
iml
INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

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Unit 13
Replacing Fuses in an Automobile

Replacing Fuses in an Automobile

After you study this lesson, you should be able to:

1. Identify tools and materials used to replace a fuse.
2. Replace a burned out fuse.

Show What You Can Do

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

TURN THE PAGE AND BEGIN

Unit 13
Replacing Fuses in an Automobile

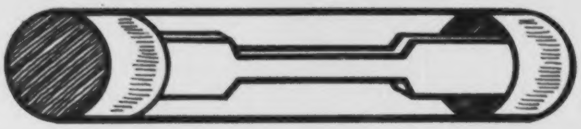
Introduction

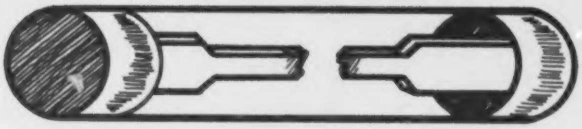
Fuses are used to protect automotive electrical paths or circuits to prevent the wires from overheating and causing fires. A fuse is made to burn out and stop current flow when the wires overheat.

Fuses protect electrical paths to tail lights, turn signals, heater, air conditioner and other electrical parts in an automobile. For this reason, it is important to know how to replace a burned out fuse.

This unit will show you how to find out when a fuse is burned out and how to replace it.

Good Fuse





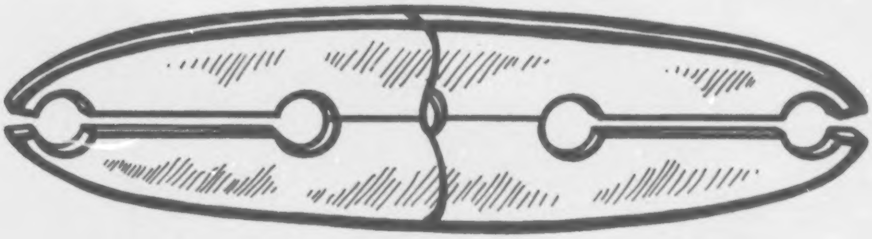
Burned Out Fuse

TURN TO NEXT PAGE

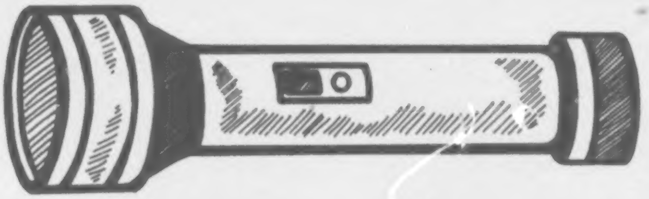
Unit 13
Replacing Fuses in an Automobile

A. Tools, Materials and Equipment for Replacing Fuses in an Automobile.

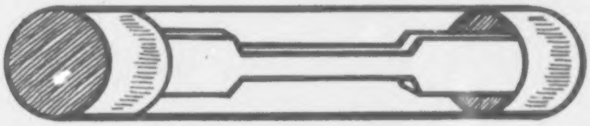
1. **FUSE PULLER:** Tool used to remove burned out fuses.



2. **FLASHLIGHT:** Used to light the area where the fuses are located.



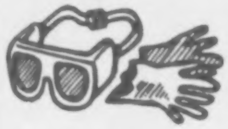
3. **FUSES:** Safety devices which break the flow of current automatically, when automobile electrical paths are overheated.



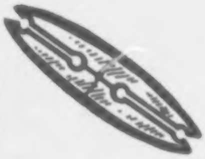
TURN TO NEXT PAGE

B. Steps for Replacing Fuses in an Automobile.

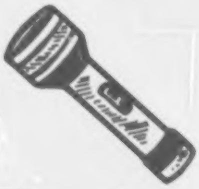
1. Find and Check Off the following:



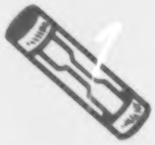
☐ **Safety Equipment**



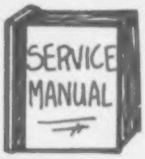
☐ **Fuse Puller**



☐ **Flashlight**

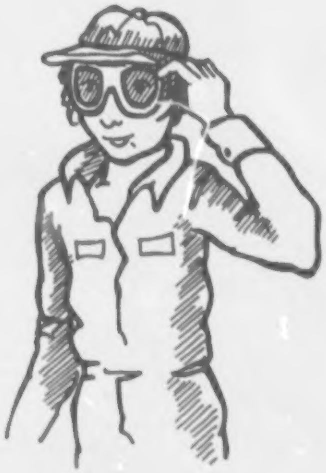


☐ **Fuse**

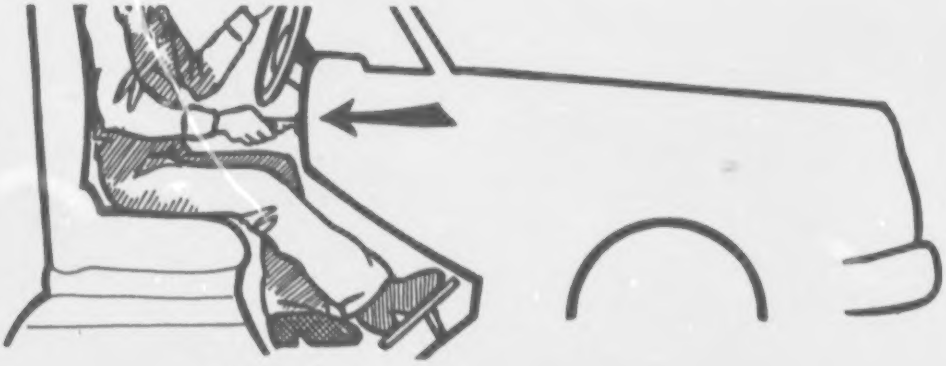


☐ **Service Manual**

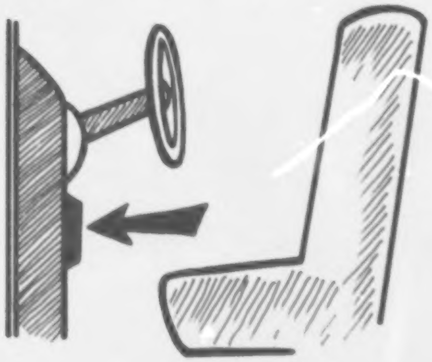
2. Wear any safety equipment your instructor thinks is necessary.



3. Turn off the car iginition and remove the ignition key.

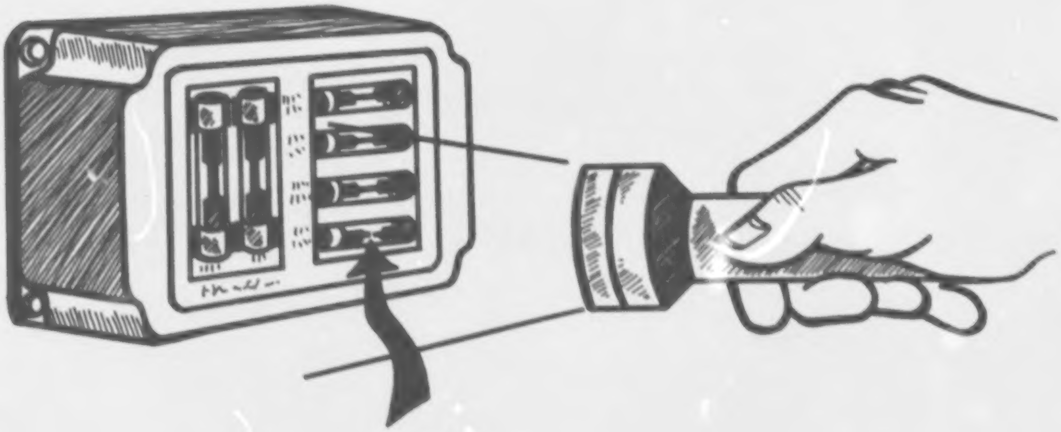


4. Refer to the service manual to locate the position of the fuse panel.

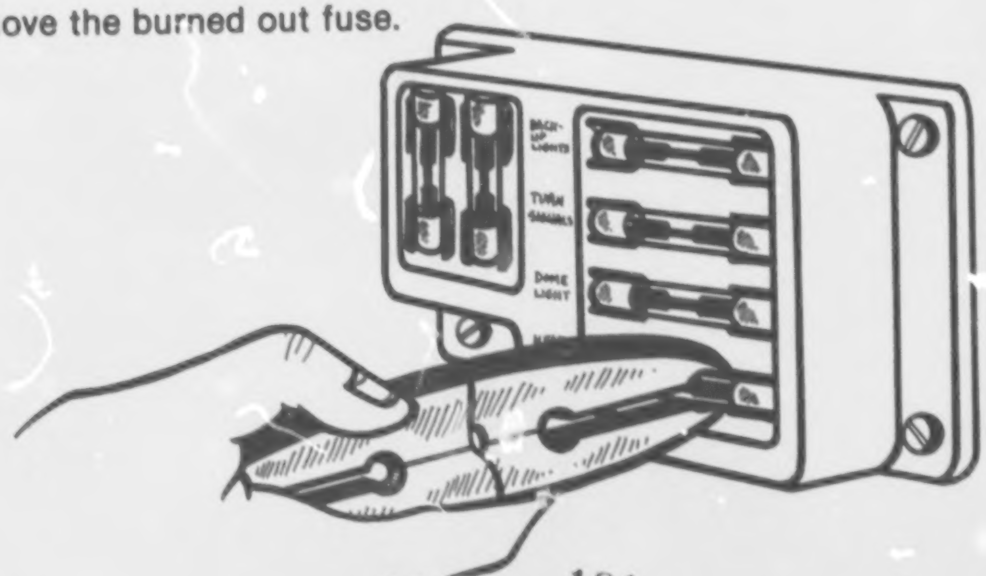


FUSE PANEL
MANUAL

5. Locate the burned out fuse or fuses in the fuse panel.

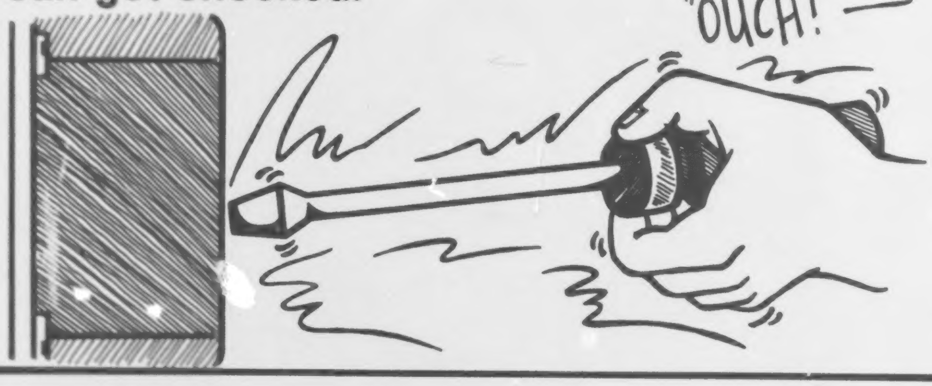


6. Remove the burned out fuse.

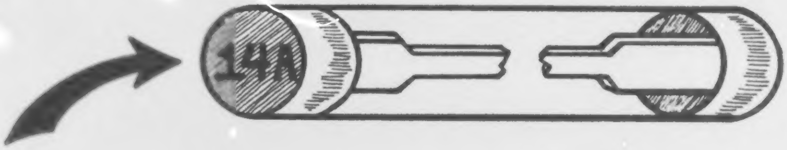

BACK-UP LIGHTS
TURN SIGNALS
DOME LIGHT

CAUTION!

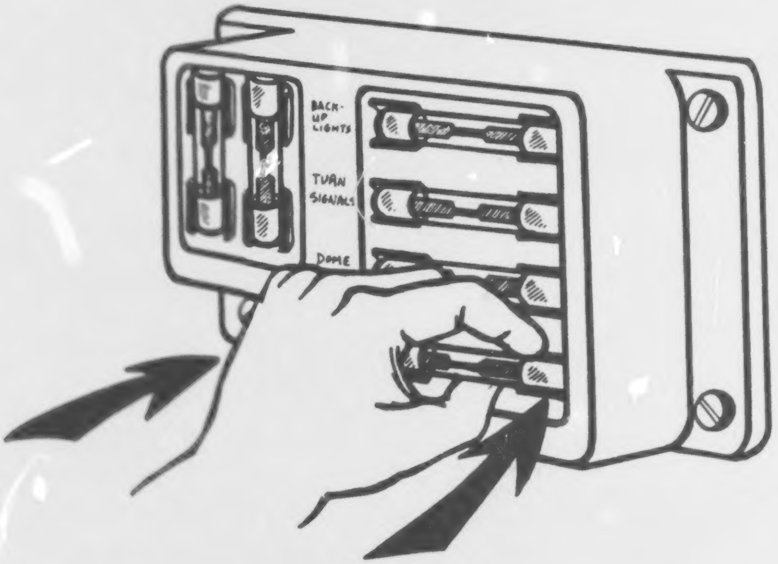
DO NOT use a screw driver or anything that conducts electricity to remove the fuse because you can get shocked.



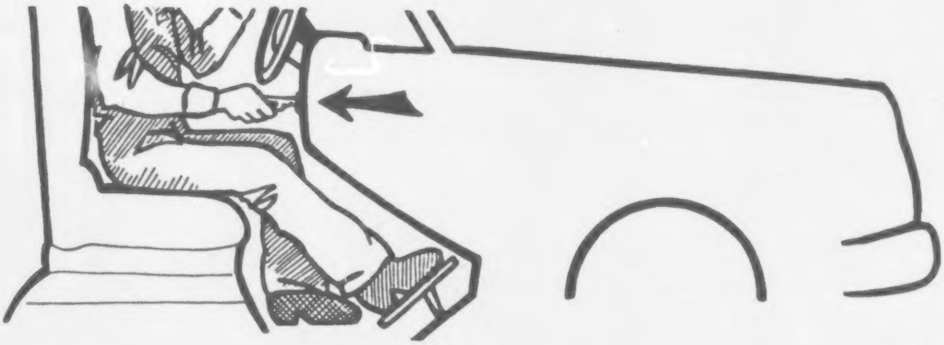
7. Look at the ends of the burned out fuse and note what is marked on it.



8. Obtain a new fuse having the same mark or number. Snap it into the fuse panel in place of the one you have just removed.


BACK-UP LIGHTS
TURN SIGNALS
DOME

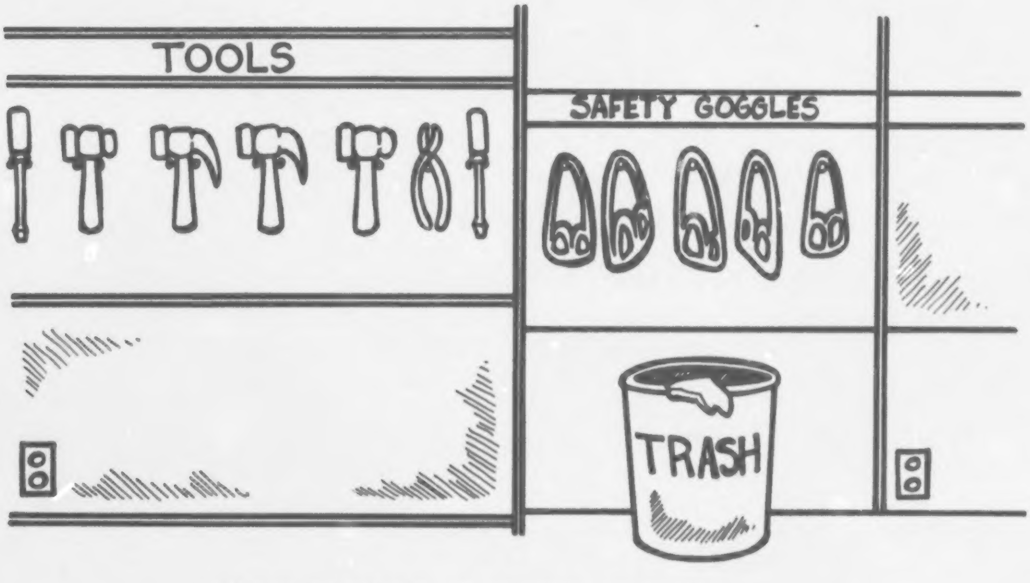
9. Turn the ignition key on and check the electrical circuit that did not work when the fuse blew.



NOTE!

If the fuse burns out again, report to the instructor.

10. Return tools to their proper places.


TOOLS
SAFETY GOGGLES
TRASH

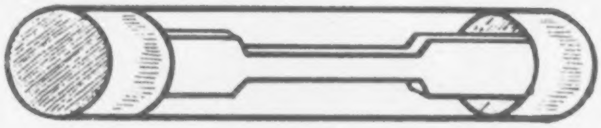
SEE YOUR INSTRUCTOR

Unit 13
Replacing Fuses in an Automobile

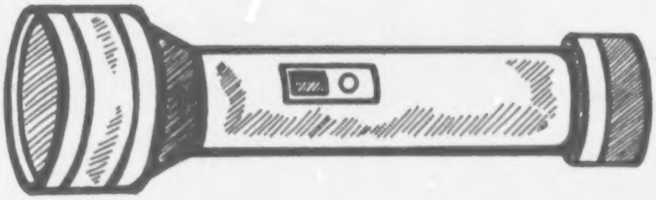
Tools and Materials Identification Exercise

Match the object with the correct words provided.

____A. Fuse Puller
____B. Flashlight
____C. Fuses



1



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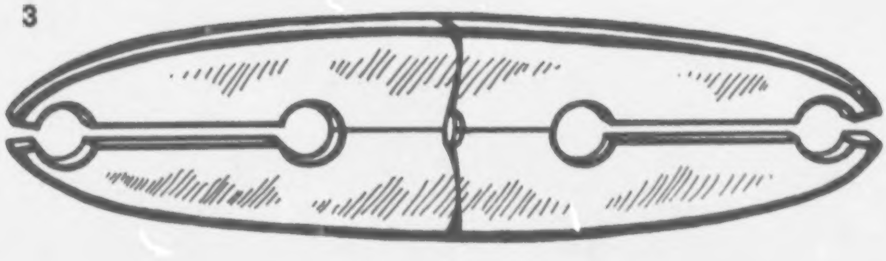
3



Unit 13
Replacing Fuses in an Automobile

Practical Exercise Performance Checklist

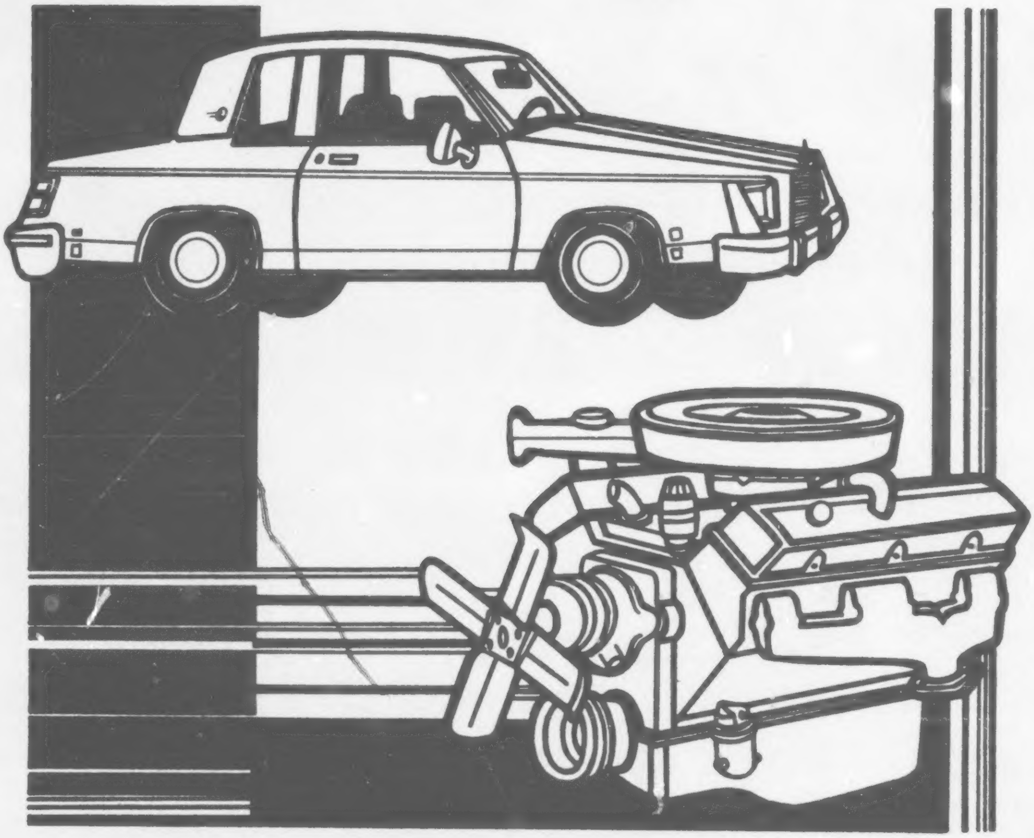
The student ____ ____________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified:			
a. Fuse puller			
b. Flashlight			
c. Fuse			
2. Wore proper safety equipment.			
3. Turned off the car ignition.			
4. Referred to the service manual for the location of the fuse panel.			
5. Located burned out fuse on fuse panel.			
6. Safely removed burned fuse.			
7. Noted the amperage stamped on the metal ends of the burned out fuse.			
8. Obtained a new fuse having same size as burned out fuse.			
9. Snapped the new fuse into the fuse panel.			
10. Started the car and turned on the switch controlling the circuit.			
11. Cleaned work area and returned tools to their proper places.			

Satisfactory Performance ☐
Should Move On ☐
Repeat Exercise ☐

Instructor's Signature ____________ Date ____________

Vocational Preparation Curriculum
AUTO SERVICE



Unit 14

Cleaning, Washing and Waxing a Car

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION
iml
INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

Unit 14
Cleaning, Washing and Waxing a Car

Cleaning, Washing and Waxing a Car

After you study this lesson, you should be able to:

1. Identify tools, materials and equipment used in cleaning, washing and waxing a car.
2. Clean a car inside and out.
3. Wax and buff the outside of a car.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

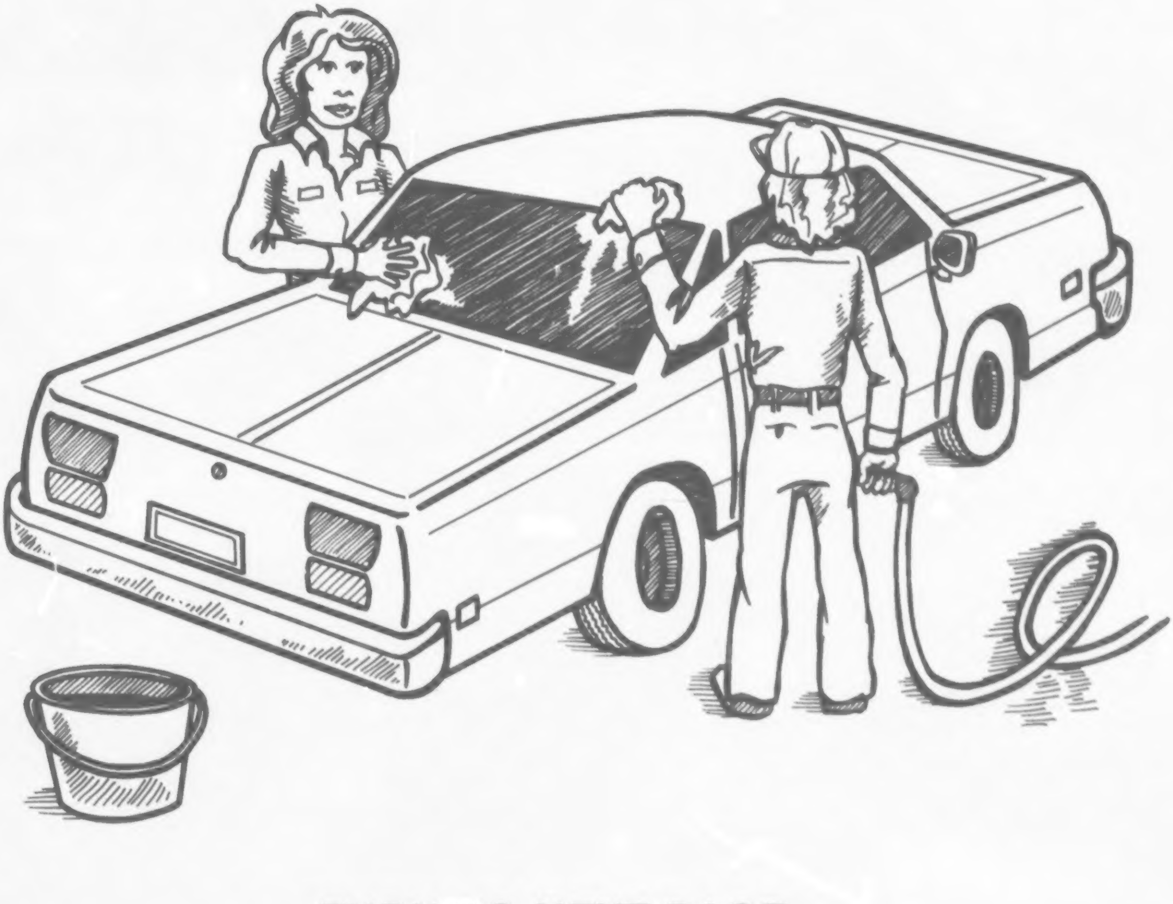
2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

TURN THE PAGE AND BEGIN

Unit 14
Cleaning, Washing and Waxing a Car

Introduction

Cars are exposed to many kinds of dirt and grime that can ruin the finish of a car and cause the body to rust. Therefore, it is important to properly wash and wax a car for protection. One of the jobs of an auto service worker is cleaning, washing, and waxing a car. In this lesson you will learn the proper way to do this.



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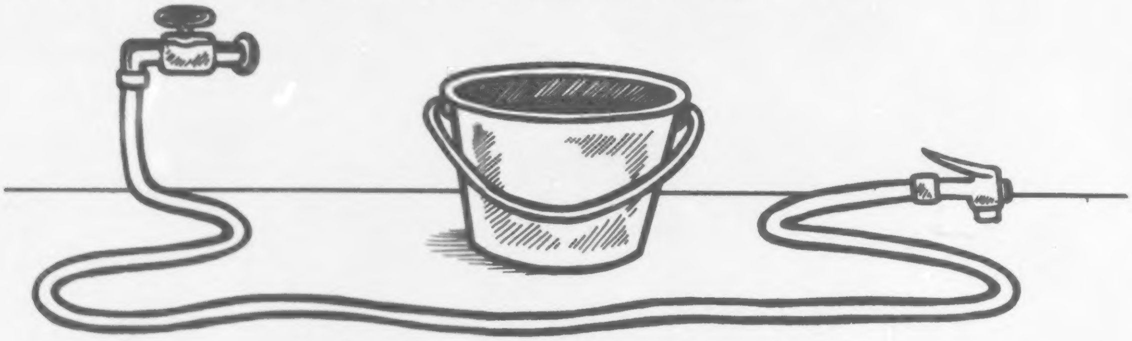
Unit 14

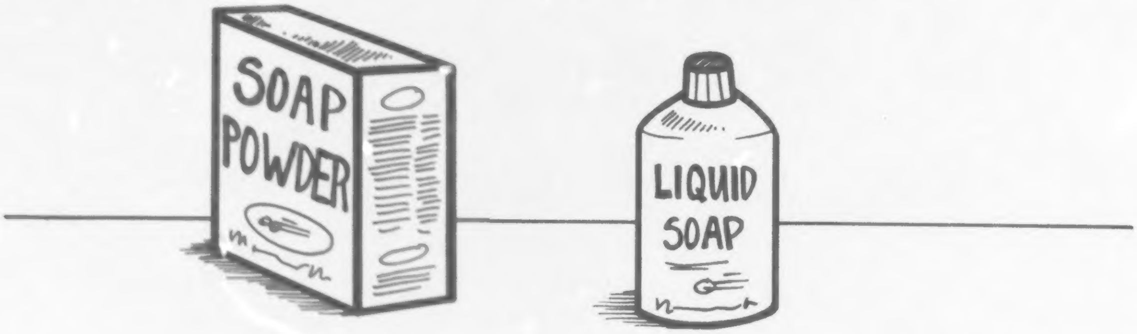
Cleaning, Washing and Waxing a Car

A. Tools, Materials and Equipment for Cleaning, Washing and Waxing a Car.

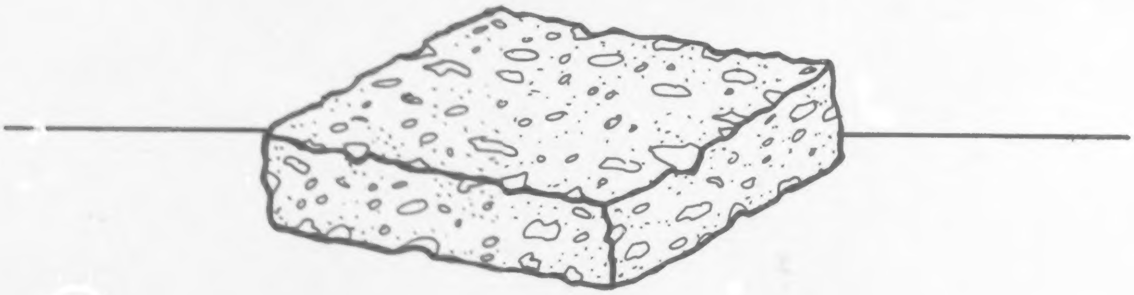
1. **WATER:** Used to wash and rinse dirt from car.



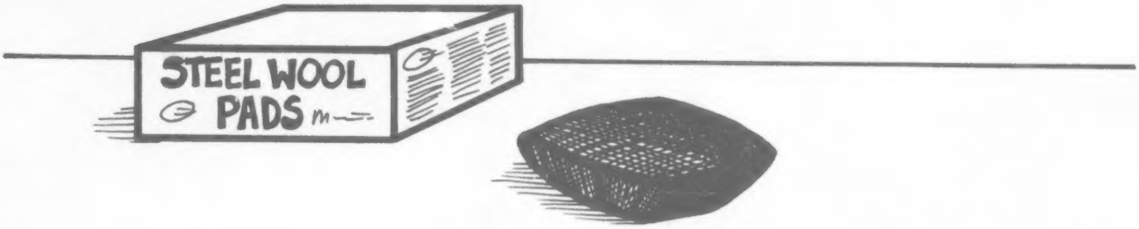
2. **SOAP:** Powder or liquid used with water to wash car.



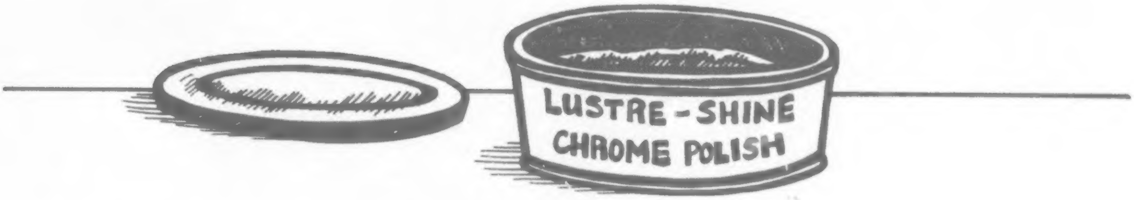
3. **SPONGES:** Used to apply soapy water to car body.



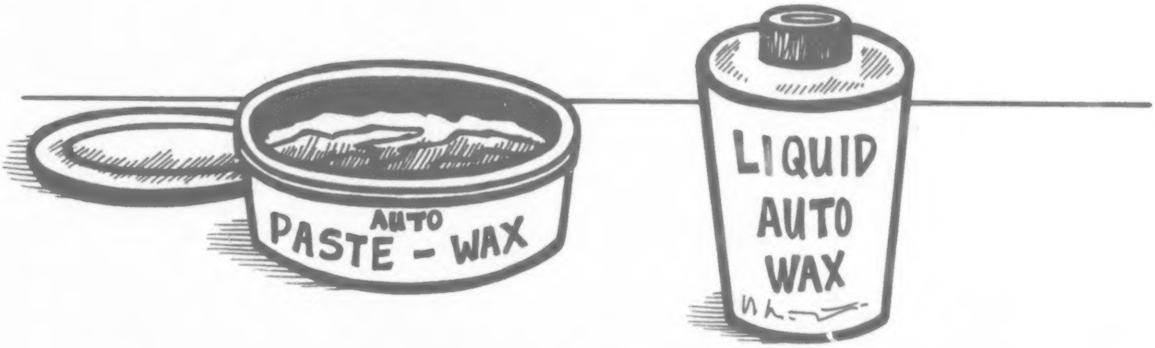
4. **STEEL WOOL PADS:** Used to scrub stains and marks from rubber tires.


STEEL WOOL
PADS

5. **CHROME CLEANER:** Paste or liquid used to clean and shine chrome.

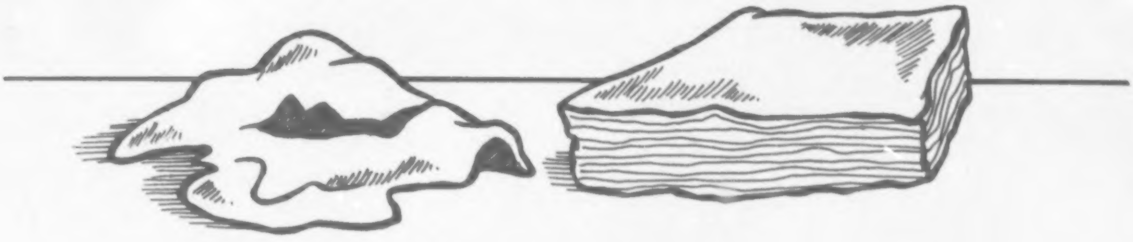

LUSTRE - SHINE
CHROME POLISH

6. **AUTO WAX:** A liquid or paste used to coat the auto body to protect car finish.

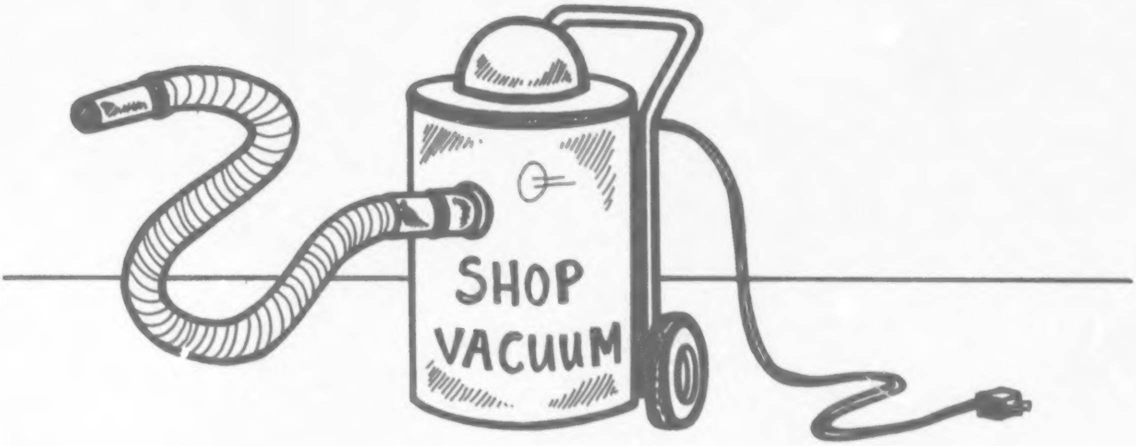

AUTO
PASTE - WAX
LIQUID
AUTO
WAX

190

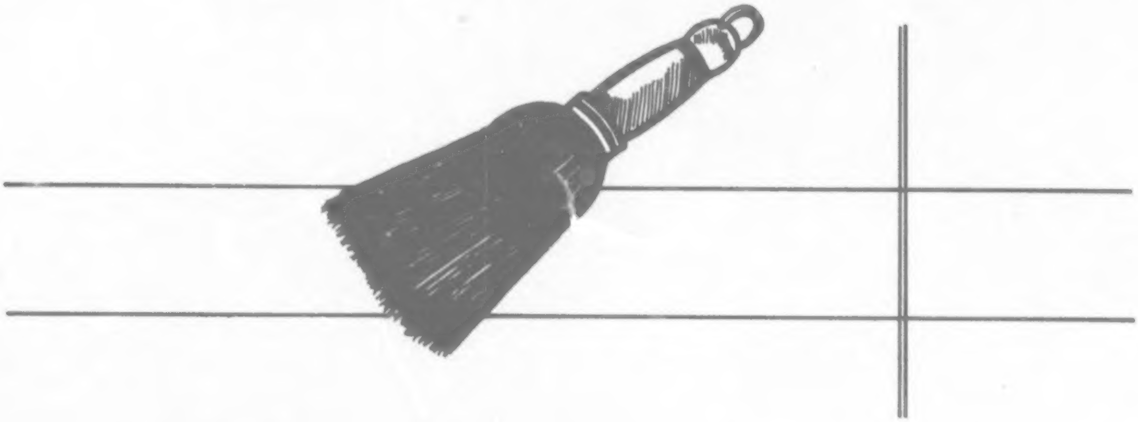
7. **CLEAN CLOTH:** Used to apply wax and buff wax off. Cloth is also used to wash cars.



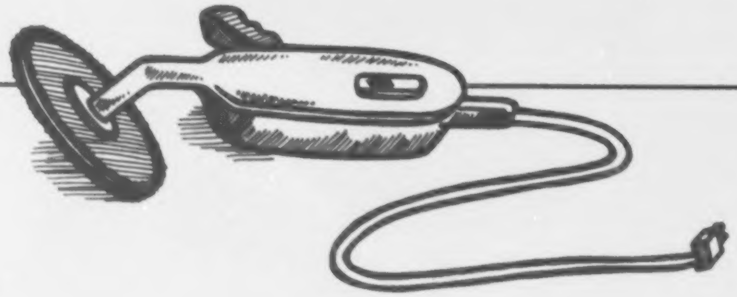
8. **VACUUM CLEANER:** Used to vacuum dirt from inside of car.



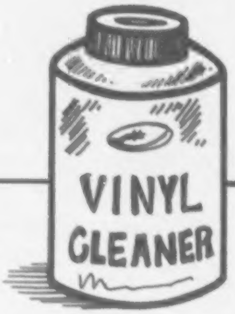
9. **WHISK BROOM:** Used to sweep inside of car.



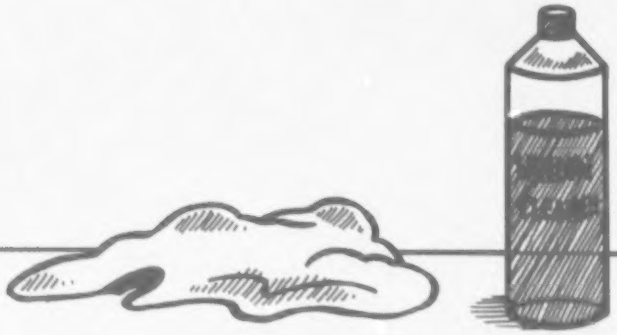
10. **ELECTRIC BUFFER:** Used to polish the auto body after wax has been applied.



11. **VINYL CLEANER:** Substance used to remove dirt from vinyl top and vinyl interior.



12. **WINDOW CLEANER:** Used to remove bugs and dirt from car windows.



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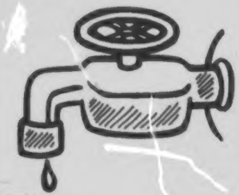
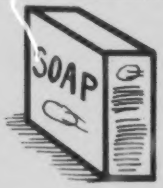
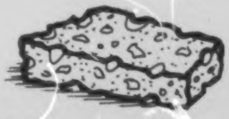
B. Steps for Cleaning and Washing a Car.

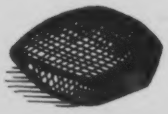
1. Find and Check Off the following:

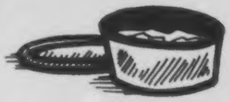

☐ Water

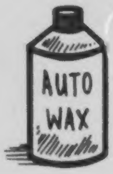


☐ Soap

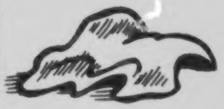

☐ Sponges

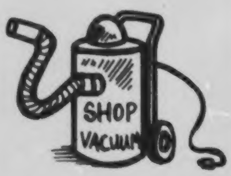

☐ Steel Wool Pads

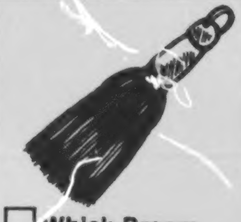

☐ Chrome Cleaner

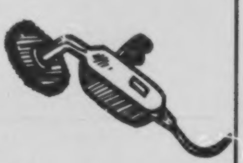


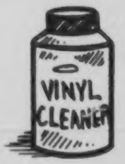
☐ Auto Wax

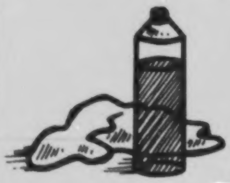

☐ Clean Cloth


SHOP
VACUUM
☐ Vacuum Cleaner

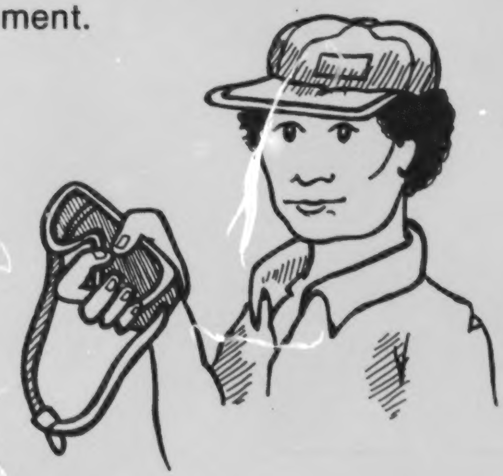

☐ Whisk Broom


☐ Electric Buffer

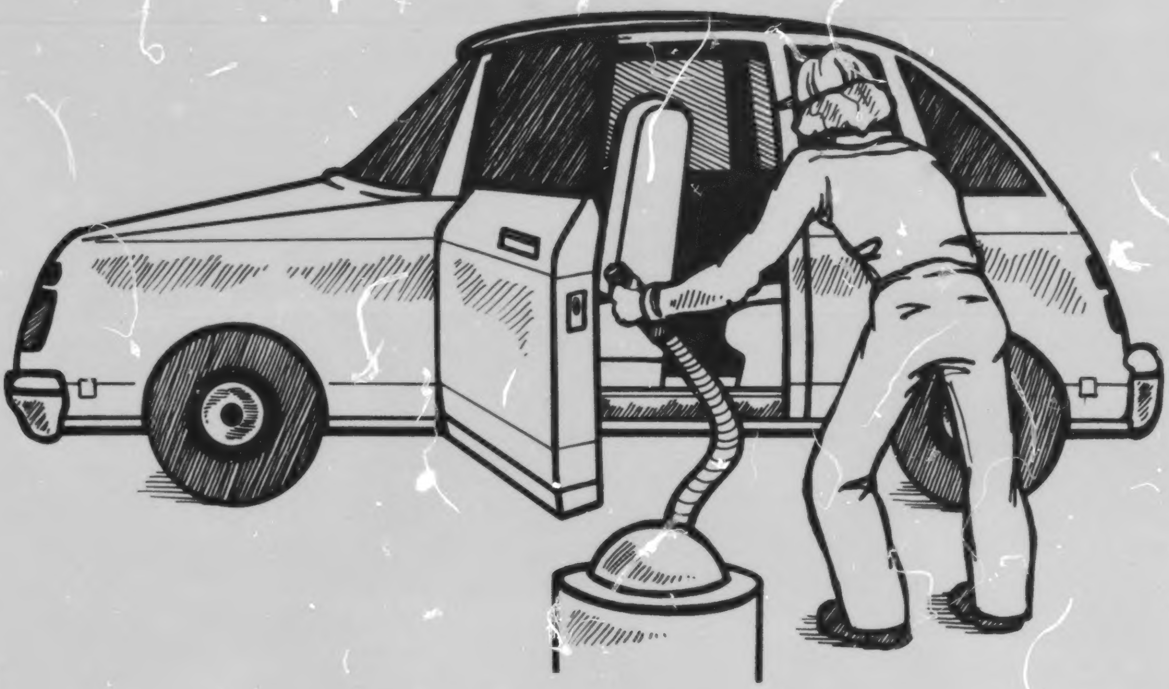

VINYL
CLEANER
☐ Vinyl Cleaner


☐ Window Cleaner

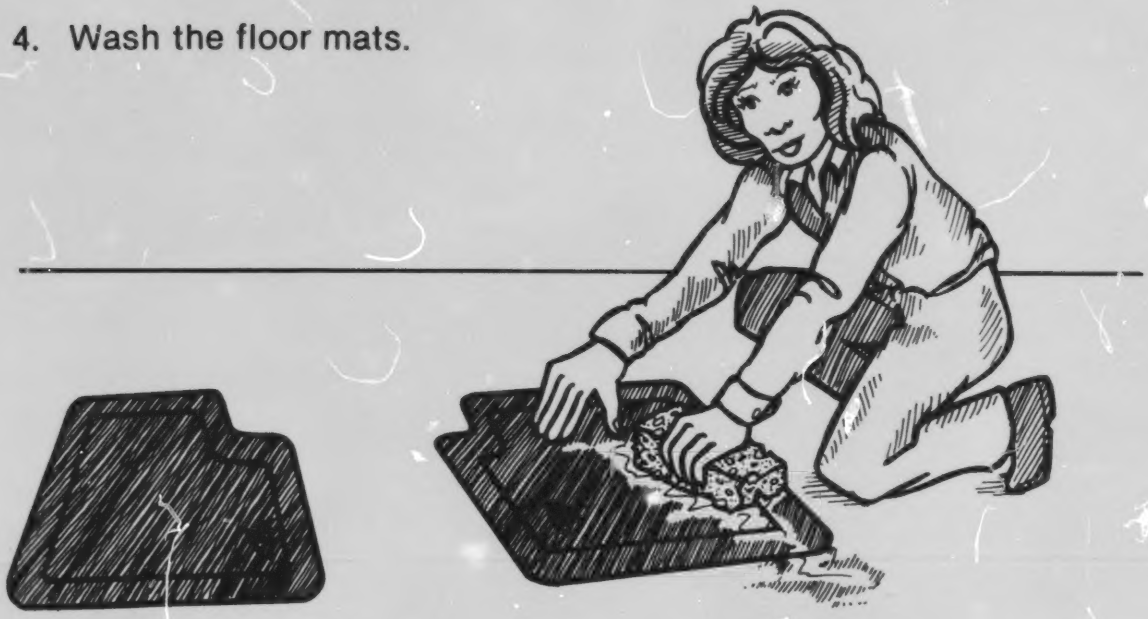
2. Wear proper safety equipment.



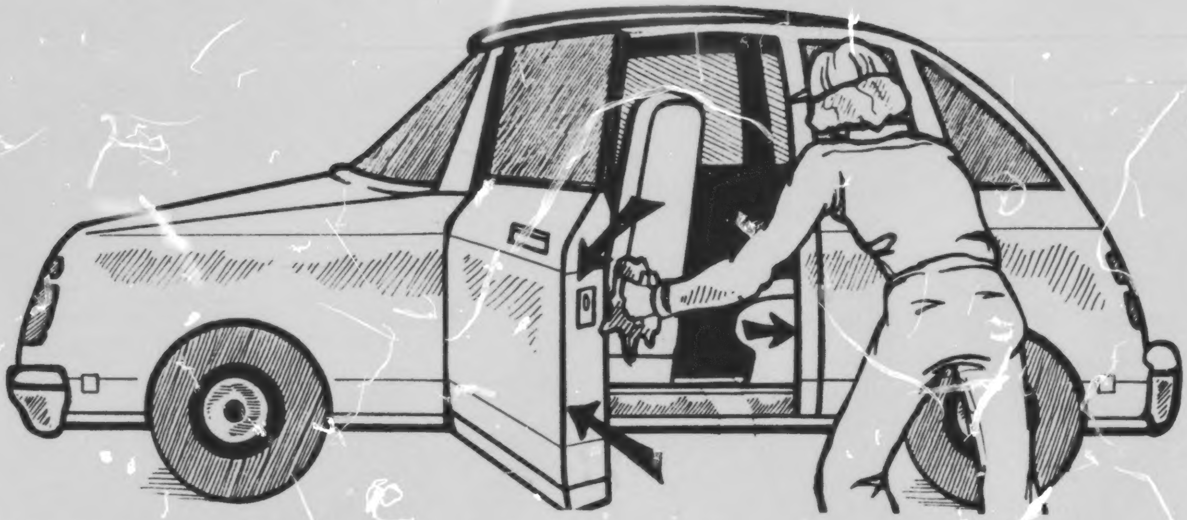
3. Remove floor mats from car. Vacuum or sweep the inside of car.



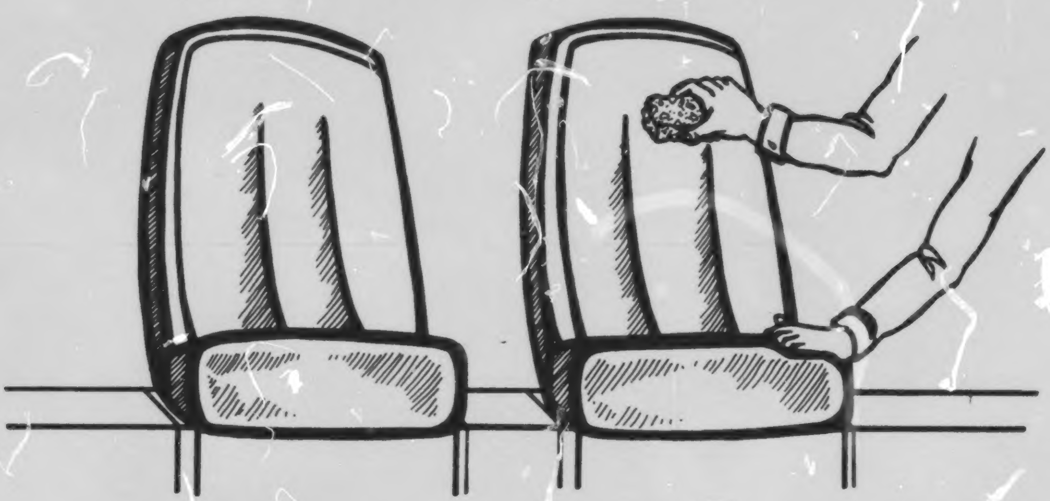
4. Wash the floor mats.



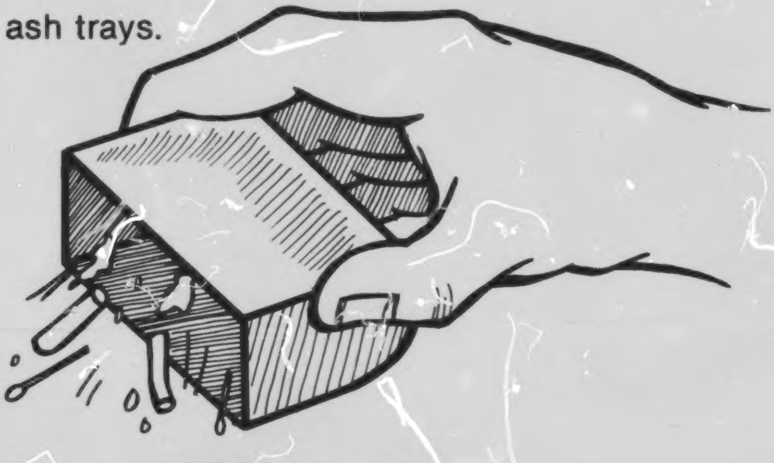
5. Clean between door and door frames.



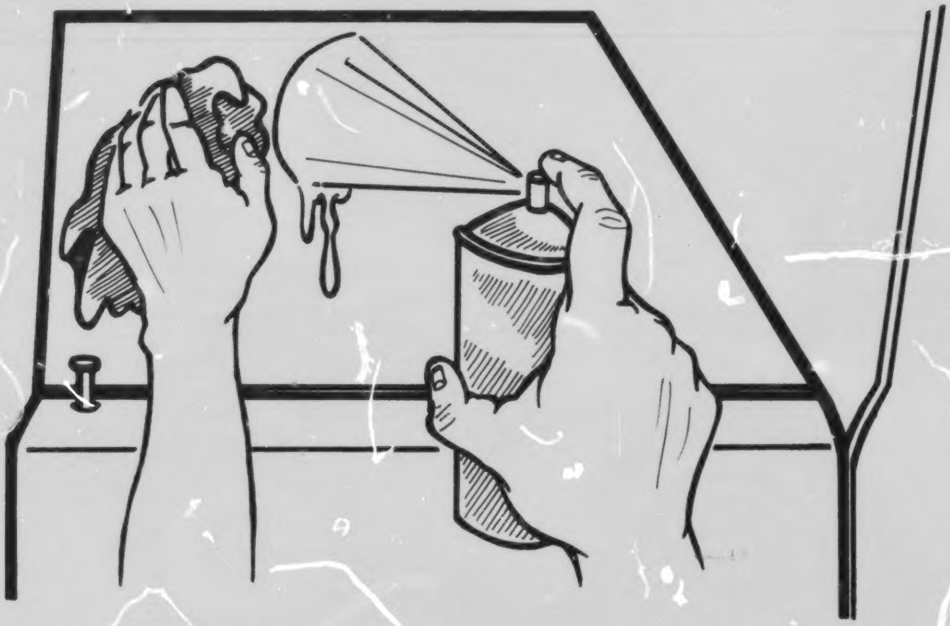
6. Clean seats and seat coverings.



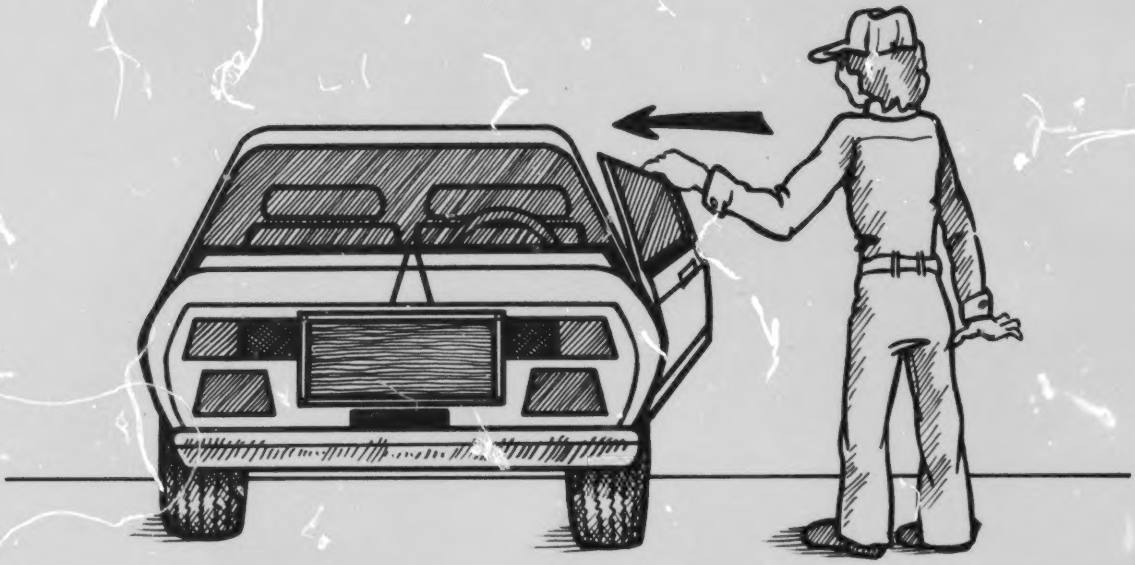
7. Empty and clean ash trays.



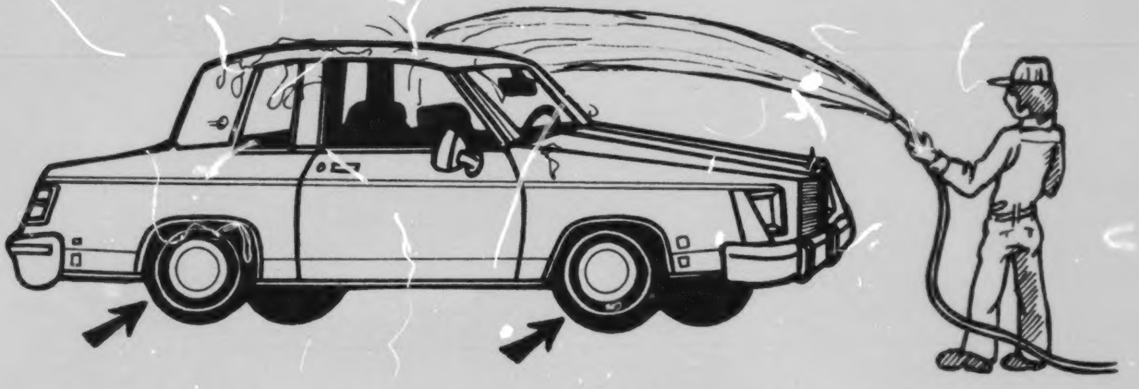
8. Clean all inside windows with a clean cloth and window cleaner. Turn cloth frequently when buffing.



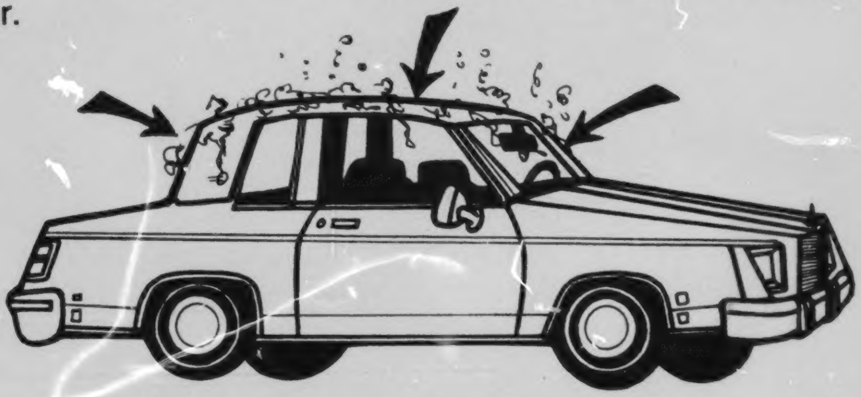
9. After car interior is cleaned, close windows and doors tightly.



10. Rinse car body, wheels and tires with water to loosen and remove dirt.

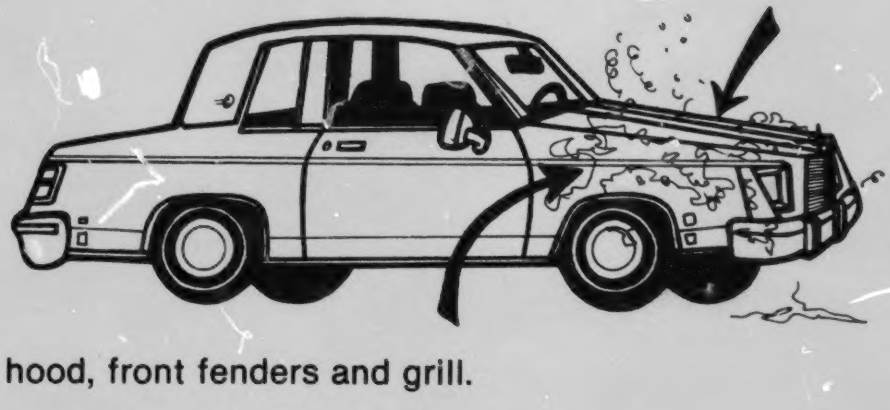


11. Wash the top of car and windows with sponge and soapy water.



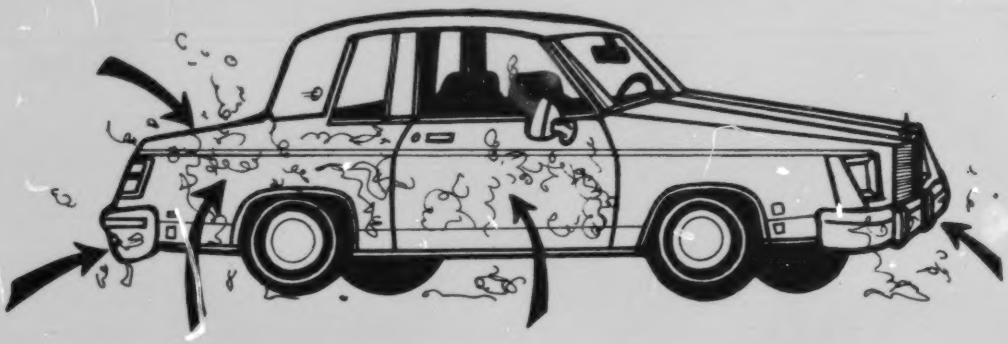
Rinse the top and windows with clean water.

12. Wash hood, front fenders and grill.

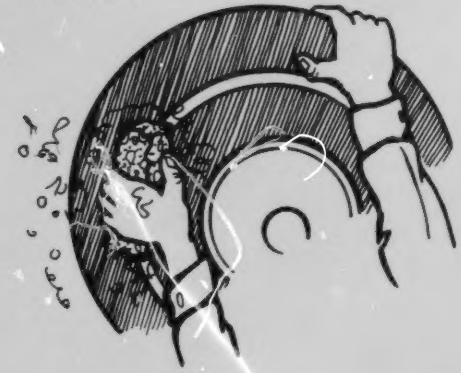


Rinse hood, front fenders and grill.

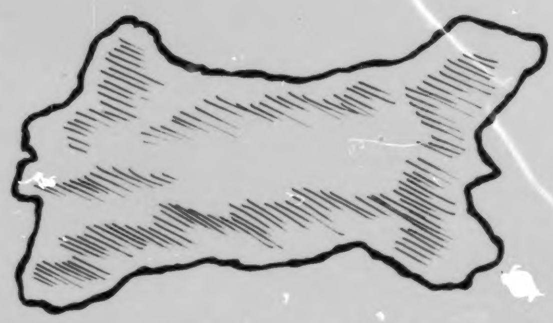
13. Wash doors, trunk, rear quarter panels, and bumpers with sponge and soapy water. Rinse with clean water.



14. Wash white wall tires. Use steel wool pads on difficult dirt or marks. Rinse with clean water.



15. Allow some time for car to completely dry or use a chamois to wipe car dry.

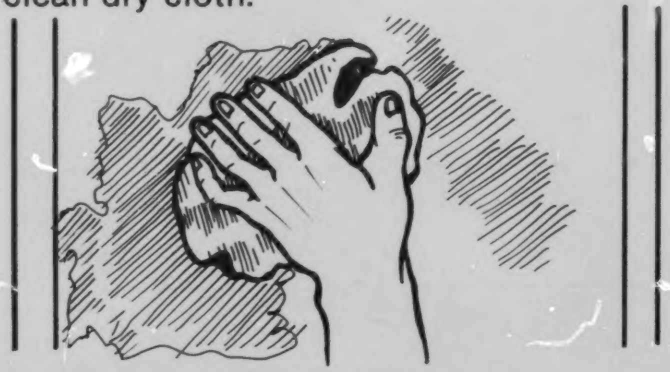


NOTE!

A chamois is a leather-like skin used to wipe dry auto finishes.

C. Steps for Cleaning and Waxing a Car.

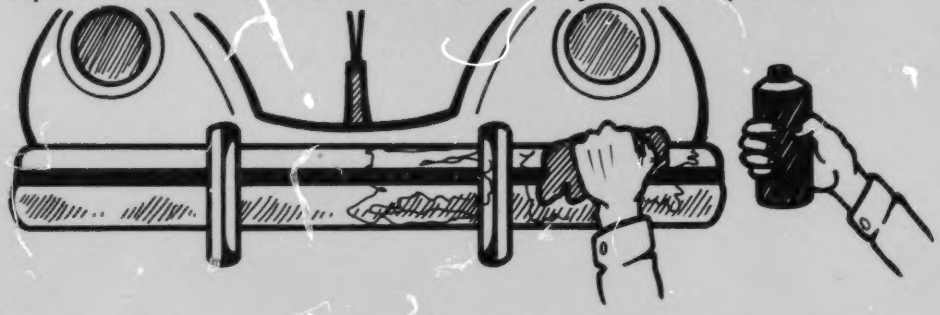
1. When car has vinyl top, apply vinyl cleaner to car top. Wipe it off with a clean dry cloth.



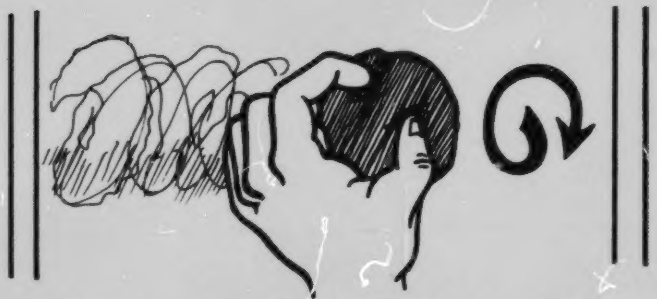
NOTE!

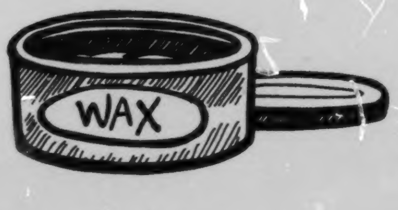
Cars with painted tops must be waxed.

2. Apply chrome cleaner to door handles, bumpers and other chrome parts. Allow chrome cleaner to dry then wipe it off.



3. Open wax container. Apply wax in a circular motion with a clean cloth or applicator.



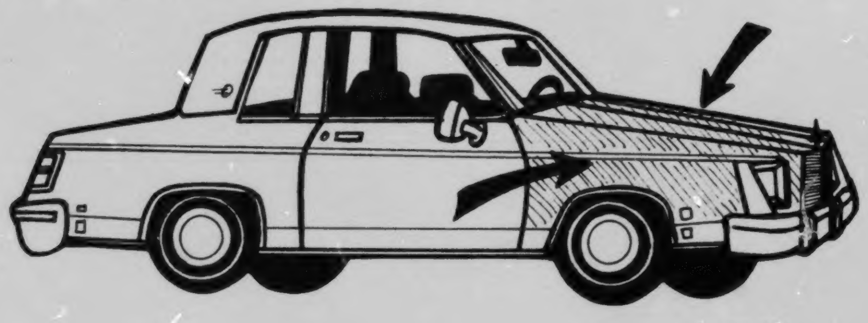


Allow wax to dry then wipe or buff wax from car with clean cloth.

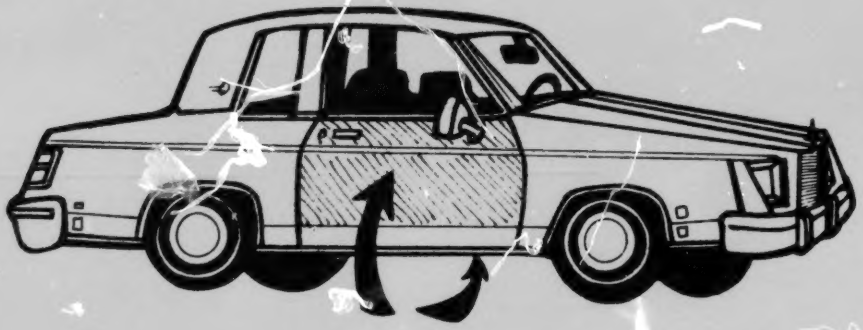
NOTE!

Apply and buff wax on one auto body panel at a time.

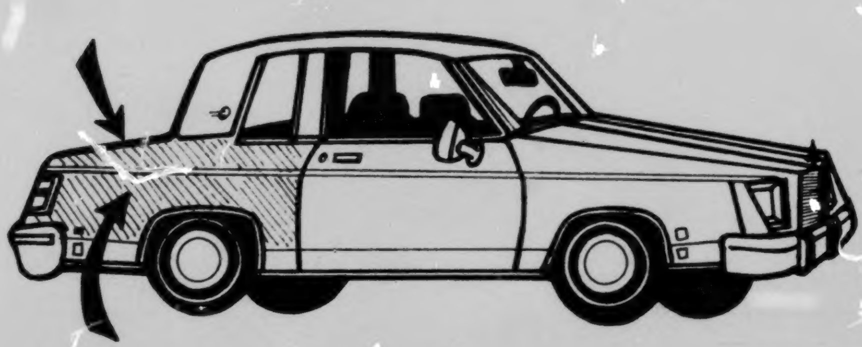
4. Wax and buff hood and front fenders.



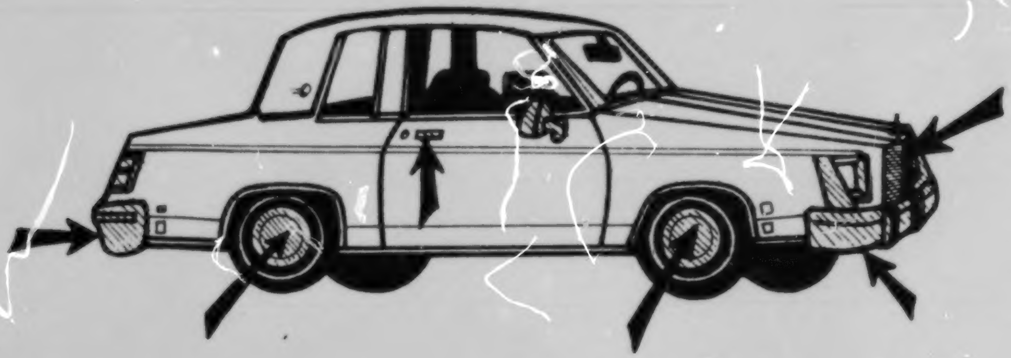
5. Wax and buff doors on each side.



6. Wax and buff trunk and rear quarter panels.



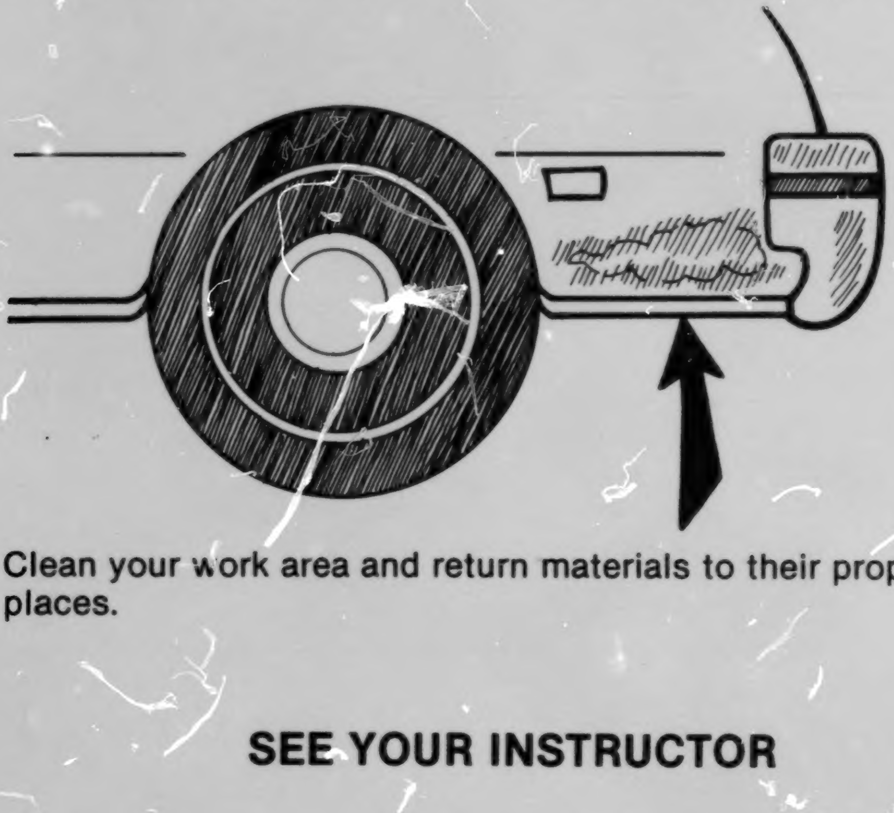
7. Wax and buff bumpers, grills, door handles, wheel covers and other chrome parts on the car.



NOTE!

An electric buffer can be used to finish buffing the car. Be careful not to apply too much pressure when using the electric buffer.

8. Inspect car for spots you missed. Wax or buff any you find.



9. Clean your work area and return materials to their proper places.

SEE YOUR INSTRUCTOR

Unit 14
Cleaning, Washing and Waxing a Car

Practical Exercise Performance Checklist

The student ____________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified:			
a. Soap			
b. Sponges			
c. Steel wool pads			
d. Wax			
e. Clean cloth			
f. Vacuum			
g. Whisk broom			
h. Electric buffer			
i. Window cleaner			
j. Auto body cleaner			
2. Wore proper safety equipment.			
3. Swept or vacuumed inside of car.			
4. Washed floor mats.			
5. Cleaned between door and door frames.			
6. Cleaned seats and seat covers.			
7. Emptied and cleaned ash trays.			
8. Cleaned inside windows of car.			
9. Closed doors and windows tightly.			
10. Rinsed car body, wheels and tires.			
11. Washed and rinsed top of car and windows.			
12. Washed and rinsed hood and front fenders.			
13. Washed and rinsed doors, trunk, rear quarter panels and bumpers.			

Tasks	Yes	No	Comments
14. Cleaned tires and white walls.			
15. Dried the car.			
16. Applied cleaner to top of car and wiped it off.			
17. Applied chrome cleaner to chrome parts and wiped it off.			
18. Properly applied wax, allowed it to dry and buffed it off.			
19. Waxed and buffed hood and front quarter panels.			
20. Waxed and buffed doors.			
21. Waxed and buffed trunk and rear fenders.			
22. Waxed and buffed chrome parts of car.			
23. Inspected the car for any spots missed when washing, waxing or buffing.			
24. Cleaned work area and returned materials to their proper places.			

Satisfactory Performance ☐
Repeat Exercise ☐
Should Move On ☐

Instructor's Signature Date

Vocational Preparation Curriculum
AUTO SERVICE

Unit 15

Tire Identification

Developed By: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION
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INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

Unit 15
Tire Identification

Tire Identification

After you study this lesson, you should be able to:

1. Identify types of tires.
2. Identify sizes of tires.
3. Identify load tires will hold.
4. Identify tire construction.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

TURN THE PAGE AND BEGIN

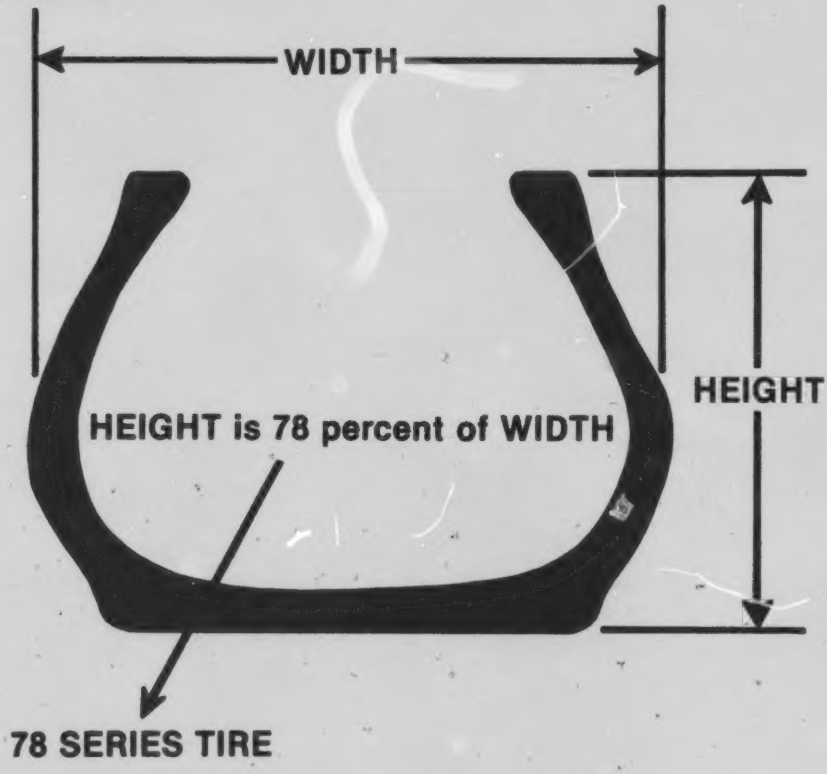
Unit 15
Tire Identification

Introduction

Tires are important to a car. Every time a car moves; starting, driving and stopping, the tires are used.

Construction of a tire determines how the tires perform and provides flexibility and strength for the tire. There are three main types of tire construction; bias, bias belted, and radial types.

To successfully work on tires you must learn to identify each type of tire by the marks on the tire. In this unit you will learn about tire identification.

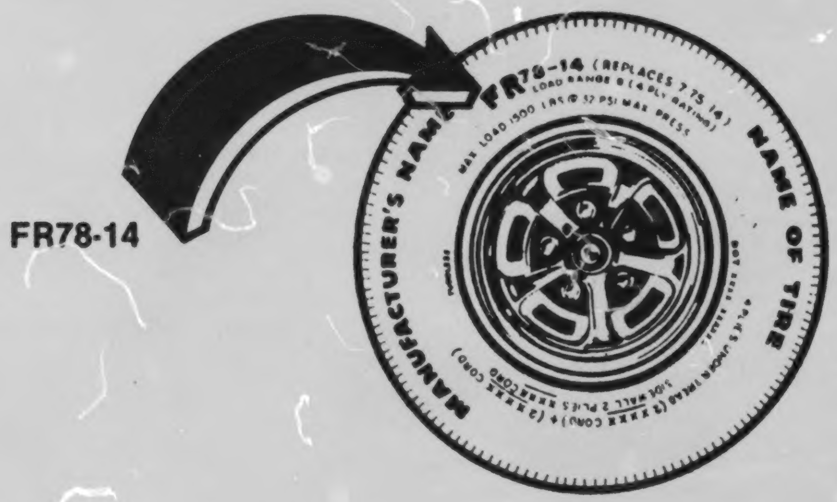

WIDTH
HEIGHT
HEIGHT is 78 percent of WIDTH
78 SERIES TIRE

TURN TO NEXT PAGE

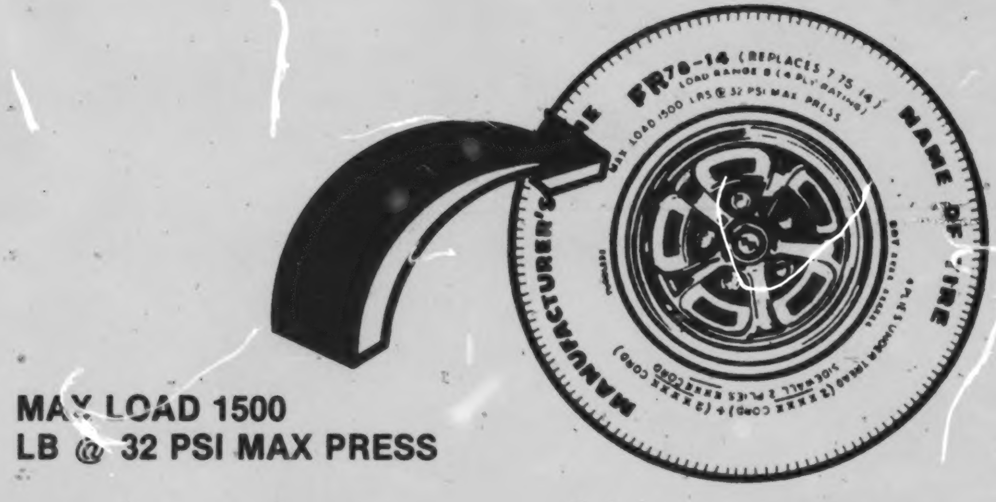
Unit 15
Tire Identification

A. Tire Identification Marks and What They Mean.

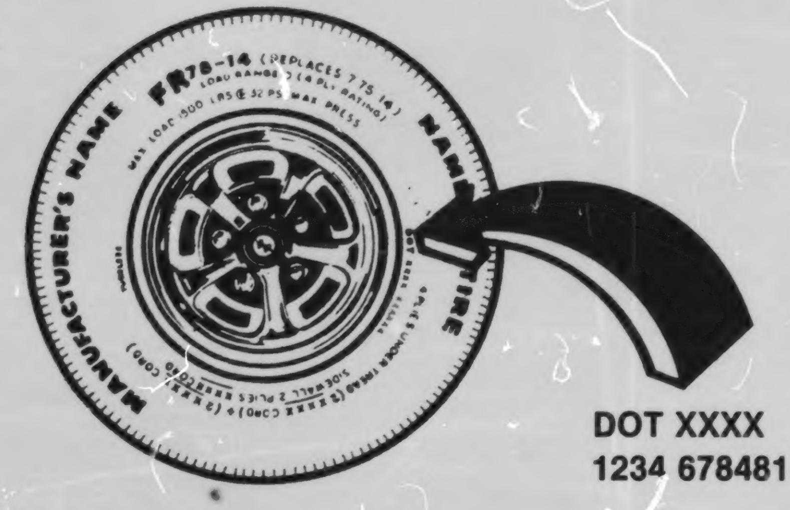
1. **TIRE SIZE:** Letters and numbers show width, type, profile and wheel size.


FR78-14
FR78-14 (REPLACES 7.75-14)
LOAD RANGE B (4 PLY RATING)
MAX LOAD 1500 LBS @ 32 PSI MAX PRESS
MANUFACTURER'S NAME
NAME OF TIRE

2. **LOAD AND PRESSURE:** Shows maximum weight a tire can support. Maximum tire pressure is also shown here.

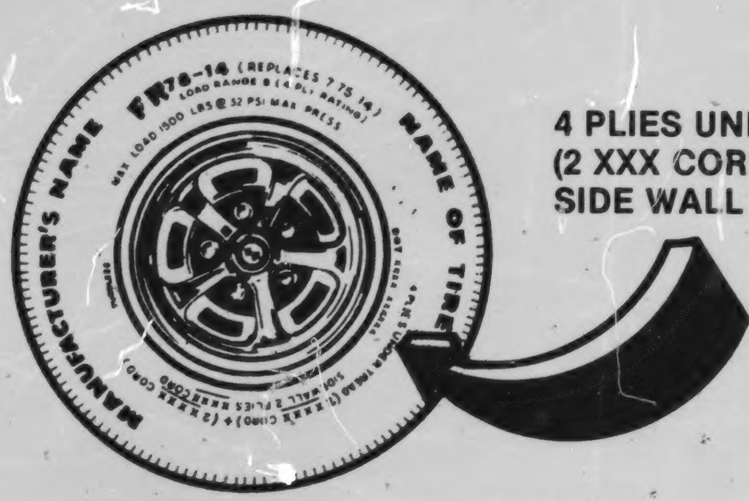

MAX LOAD 1500
LB @ 32 PSI MAX PRESS
FR78-14 (REPLACES 7.75-14)
LOAD RANGE B (4 PLY RATING)
MAX LOAD 1500 LBS @ 32 PSI MAX PRESS
MANUFACTURER'S NAME
NAME OF TIRE

3. **CERTIFICATIONS AND CODES:** Shows that the tire meets minimum standards by the Department Of Transportation (DOT). This also gives serial number and date of manufacture.


FR78-14 (REPLACES 7.75 14)
LOAD RANGE B (4 PLY RATING)
MAX LOAD 1500 LBS @ 32 PSI MAX PRESS
MANUFACTURER'S NAME
NAME OF TIRE
SIDEWALL 2 PLIES XXXXCORD
4 PLIES UNDER TREAD (2 XXXX CORD) + (2 XXXX CORD)

DOT XXXX XXXXXX
1234 678481

4. **PLIES, CORD AND BELTS:** Shows strength of the tire construction.


FR78-14 (REPLACES 7.75 14)
LOAD RANGE B (4 PLY RATING)
MAX LOAD 1500 LBS @ 32 PSI MAX PRESS
MANUFACTURER'S NAME
NAME OF TIRE
SIDEWALL 2 PLIES XXXXCORD
4 PLIES UNDER TREAD (2 XXXX CORD) + (2 XXXX CORD)

4 PLIES UNDER TREAD
(2 XXX CORD) + (2 XXX CORD)
SIDE WALL 2 PLIES XX CORD

TURN TO NEXT PAGE

B. Metric Tire Identification Marks and What They Mean.

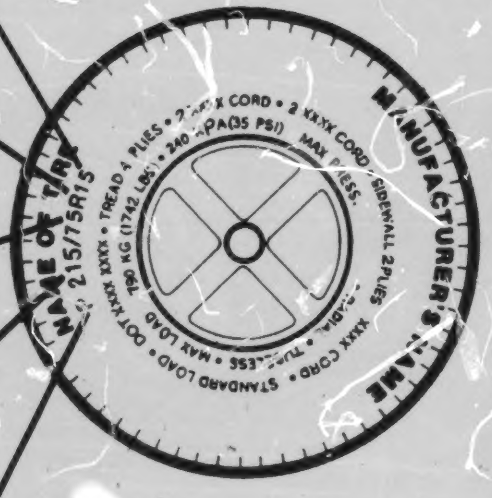
1. **WHEEL:** Number shows wheel size on which the tire fits. (15) inch

2. **TIRE TYPE:** Letter shows type of construction of the tire. (R) Radial

3. **TIRE SERIES:** Numbers show profile ratio of height to width. (75)

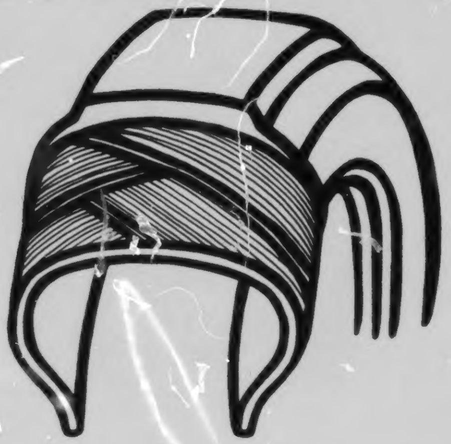
4. **TIRE WIDTH:** Numbers show tire width in metric. (215)

5. **TIRE USE:** Letter (P) shows use of tire. Metric marking means tire is to be used for passenger (P) car.


MANUFACTURER'S NAME
NAME OF TIRE
P 215/75R15
TREAD 4 PLIES • 2 XXXX CORD • 2 XXXX CORD • SIDEWALL 2 PLIES • XXXX CORD • RADIAL • TUBELESS • STANDARD LOAD • MAX LOAD 790 KG (1742 LBS) • 240 KPA (35 PSI) MAX PRESS.
DOT XXXX XXXX

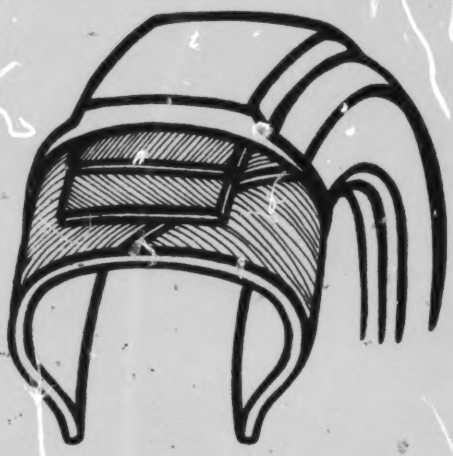
C. Three Common Types of Tires.

1. **BIAS TIRE:** A tire with body cords running at angles to each other and to the center of tire.



Bias tires are firm and good for lower speed driving.

2. **BIAS BELTED TIRE:** A tire with body cords running at angles to each other. It has extra belts to strengthen tire.

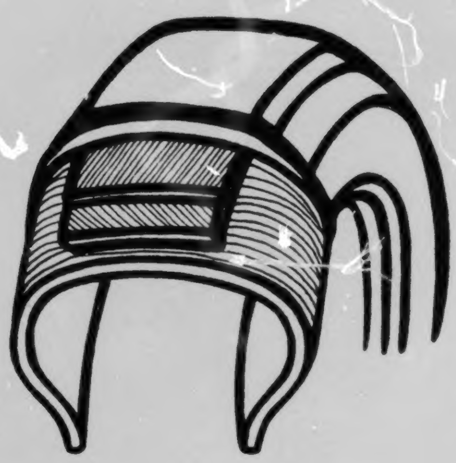


Bias belted tires are stronger and stiffer than bias ply tire.

CAUTION!

Never mix radial and biased tires. Because of their differences in construction, they can cause steering and handling problems.

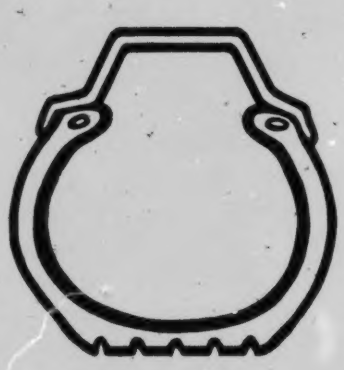
3. **RADIAL TIRE:** Body cords of a radial tire run at right angles to the center line of the tire. Belted cords are for additonal strength.



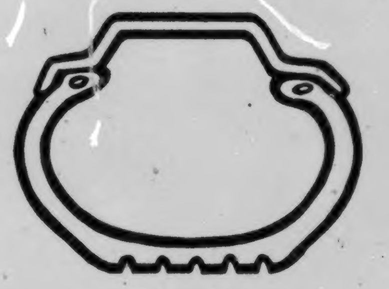
Radial tires are strong and offer good support at high speeds and long distances.

NOTE!

Tire companies are working on a new variation of the radial tire. It is the elliptic tire. It can hold 50 percent more air pressure, reduce rolling resistance and can increase fuel economy. The elliptic tire must have a special low flange rim.



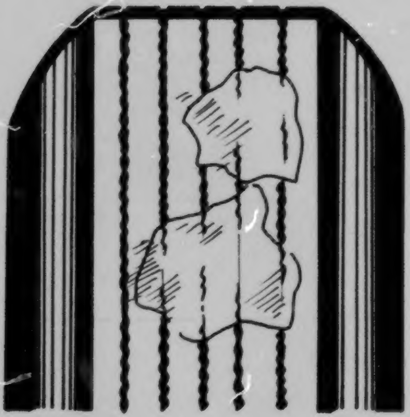
RADIAL



ELLIPTIC

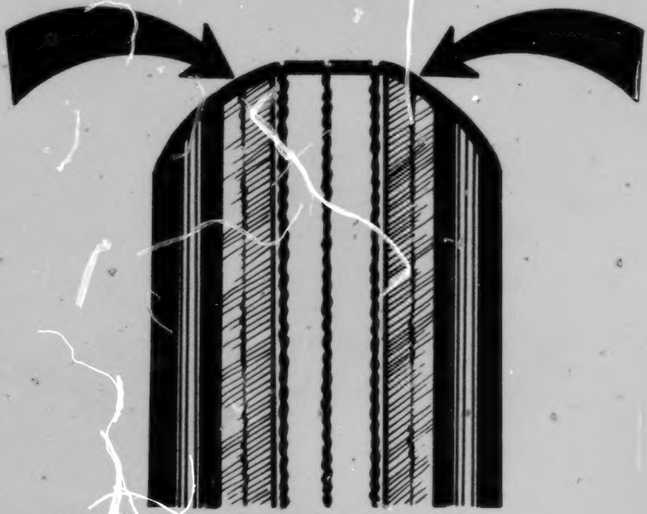
D. Types of Tire Wear and their Causes.

1. **BALD OR SMOOTH SPOTS:** are caused by improperly balanced wheels.



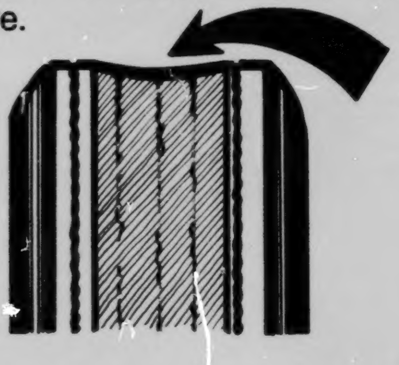
To correct the problem, balance the wheel.

2. **SHOULDER WEAR:** is caused by not having enough air in the tire to properly inflate it.



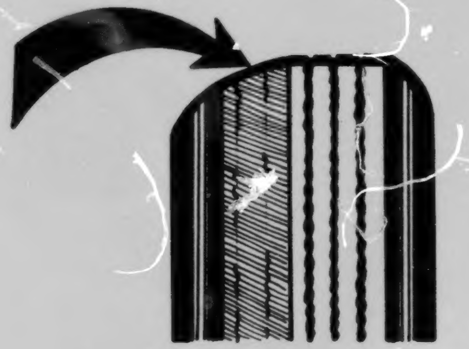
To correct the problem, inflate tire to correct specification.

3. **WEAR AT TIRE CENTER:** is caused by too much air or over inflation of the tire.



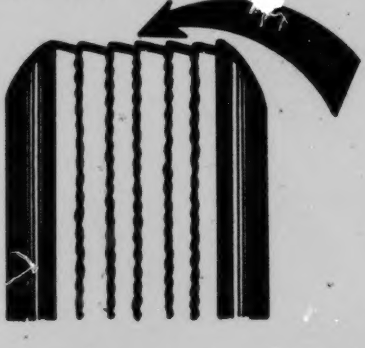
To correct the problem, adjust air pressure to correct specification.

4. **WEAR ON ONE SIDE:** is caused by too much tilt or camber on the tire.



To correct problem, adjust camber to proper specifications.

5. **FEATHERED EDGE:** is caused by incorrect distance between front and rear wheels (toe-in or toe-out).



To correct the problem, adjust toe-in or toe-out.

Unit 15
Tire Identification

Tire Identification Exercise

Fill in blank space with letter or number to identify the tire on this page.

A. Size of the wheel is ________

B. Type of the wheel is____________

C. This tire is used on what vehicle________________

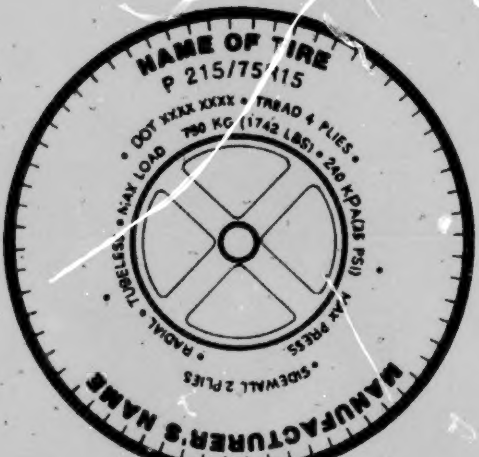
D. Tire width number is ______

E. This tire series height and width is________________

F. Number of plies in tire is ____

G. Department of Transportation mark is_____________

H. The load this tire will hold safely is_____lbs.


NAME OF TIRE
P 215/75R15
DOT XXXX XXXX • TREAD 4 PLIES •
790 KG (1742 LBS) • 240 KPA (35 PSI) MAX PRESS •
SIDEWALL 2 PLIES •
RADIAL • TUBELESS • MAX LOAD
MANUFACTURER'S NAME

Unit 15
Tire Identification

Practical Exercise Performance Checklist

The student ____________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified Standard and Metric:			
a. Tire size			
b. Load and pressure			
c. Certifications and codes			
d. Plies, cord and belts			
2. Correctly identified a bias tire.			
3. Correctly identified a bias belted tire.			
4. Correctly identified a radial tire.			
5. Correctly identified bald or smooth spots.			
6. Correctly identified shoulder wear.			
7. Correctly identified wear at the tire center.			
8. Correctly identified wear on one side.			
9. Correctly identified a feathered edge.			

Satisfactory Performance ☐
Repeat Exercise ☐
Should Move On ☐

____________________ __________
Instructor's Signature Date

Vocational Preparation Curriculum
AUTO SERVICE

Unit 16

Changing a Tire

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION
IML
INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

216

Unit 16
Changing a Tire

Changing a Tire

After you study this lesson, you should be able to:

1. Remove tire and wheel from a car.
2. Replace front tire of a car.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

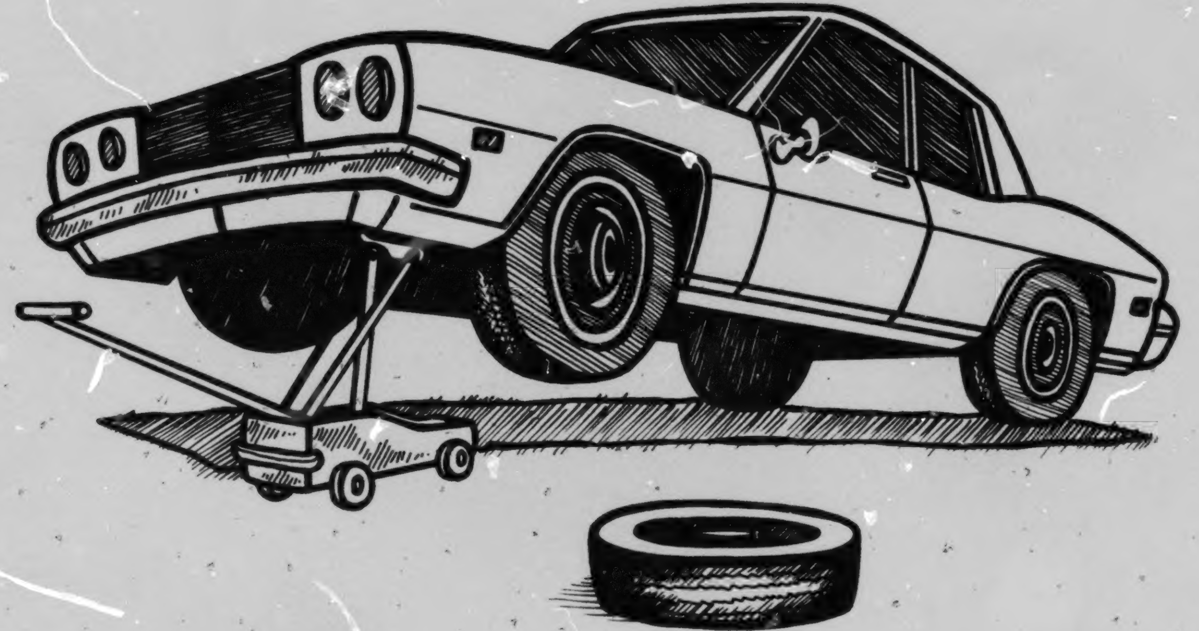
TURN THE PAGE AND BEGIN

Unit 16
Changing a Tire

Introduction

Automobile tires will sometimes go flat. This can be caused by sharp objects puncturing the tire or the tire simply wearing out.

When a tire goes flat, a spare tire is used to replace it until the flat tire is repaired or replaced. This unit will show you how to remove a flat tire and replace it with a spare tire.

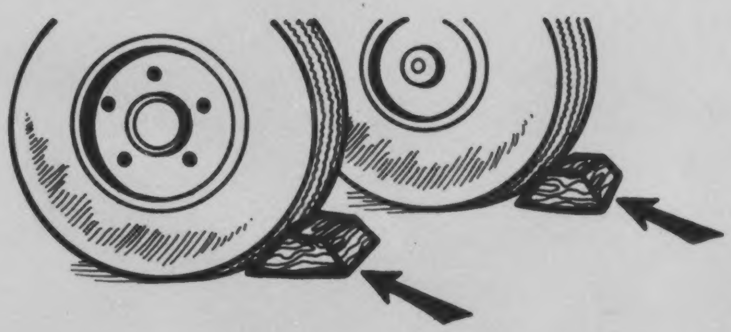


TURN TO NEXT PAGE

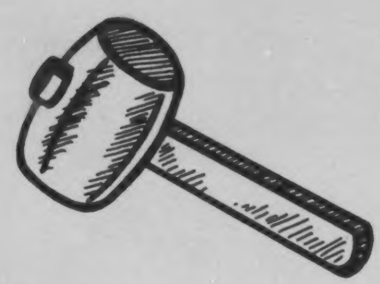
Unit 16
Changing a Tire

A. Tools, Materials and Equipment for Changing a Tire.

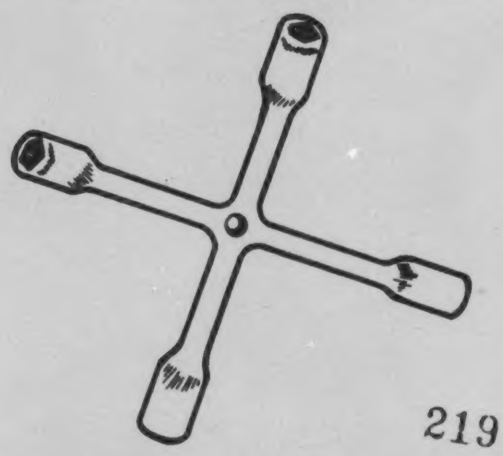
1. **WEDGE BLOCKS:** Used to block tires, to prevent the car from accidently rolling when being raised.



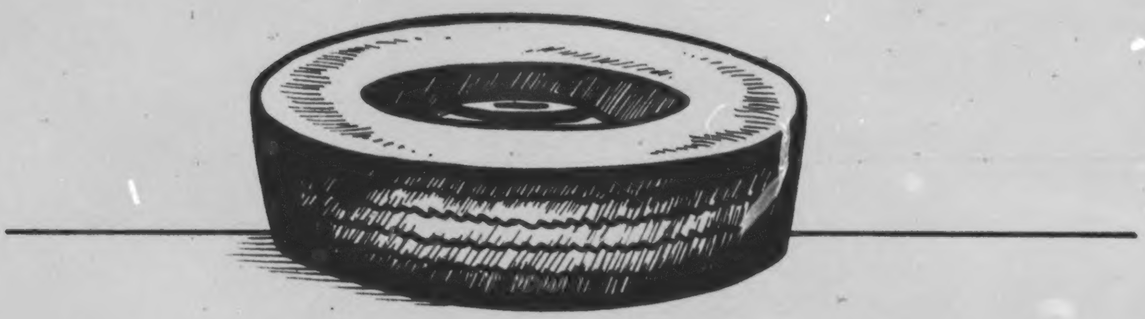
2. **RUBBER MALLET:** Used to tap on a wheel cover.



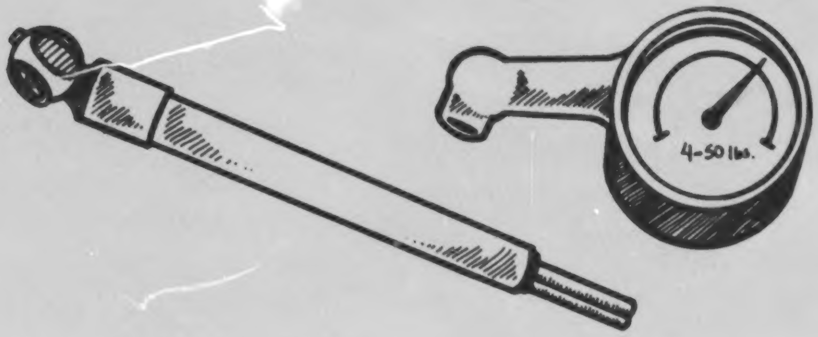
3. **LUG WRENCH:** Used to remove and tighten lug nuts on a car wheel.



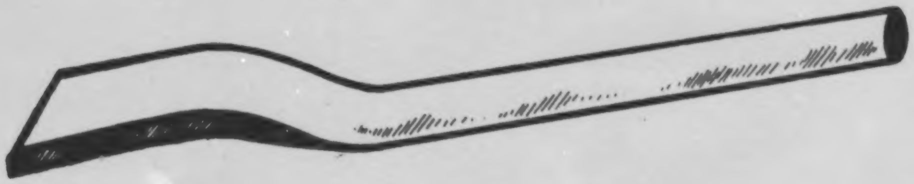
4. **SPARE TIRE:** Used to replace a flat tire.



5. **TIRE PRESSURE GAUGE:** Used to check air pressure in tires.



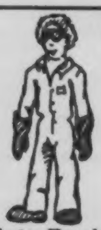
6. **PRY BAR:** Used to remove wheel cover (dust cover) from tire.

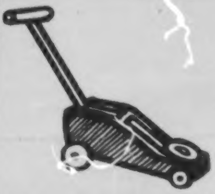


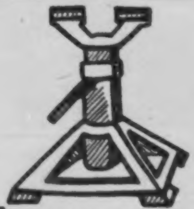
TURN TO NEXT PAGE

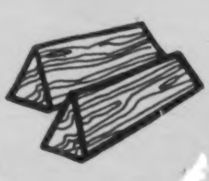
C. Steps for Changing a Tire.

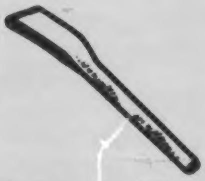
1. Find and Check Off the following:

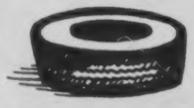

☐ Safety Equipment

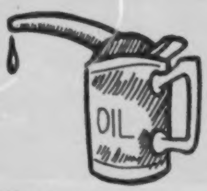

☐ Car Jack

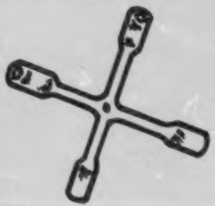

☐ Jack Stands

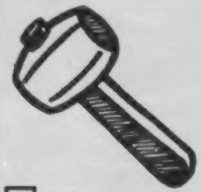

☐ Wedge Blocks

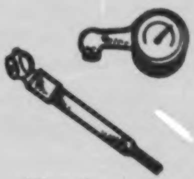

☐ Pry Bar


☐ Spare Tire

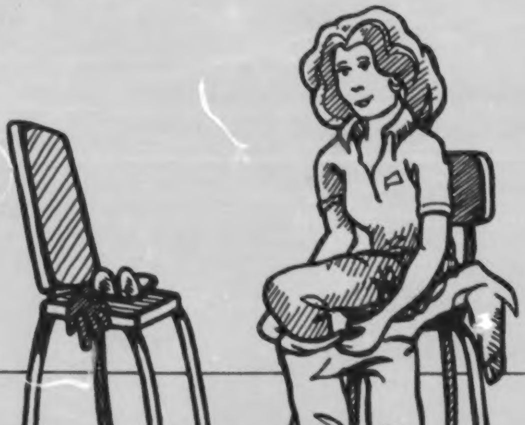

☐ Oil Can


☐ Lug Wrench

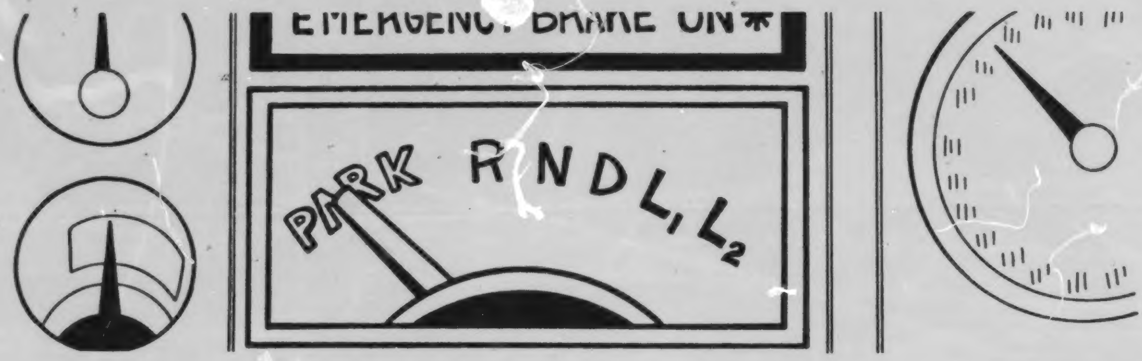

☐ Rubber Mallet


☐ Tire Pressure Gauge

2. Wear proper safety equipment.

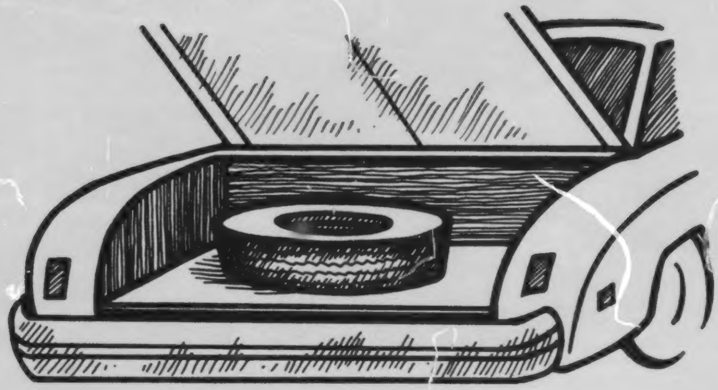


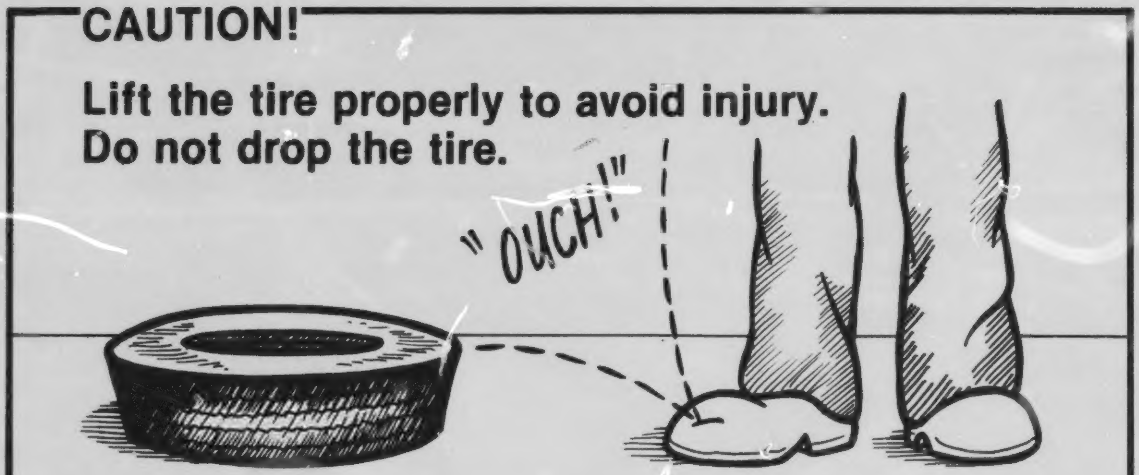
3. Park vehicle on level ground.


EMERGENCY BRAKE ON*
PARK R N D L1 L2

Put the car in gear or in park and put on the emergency brake.

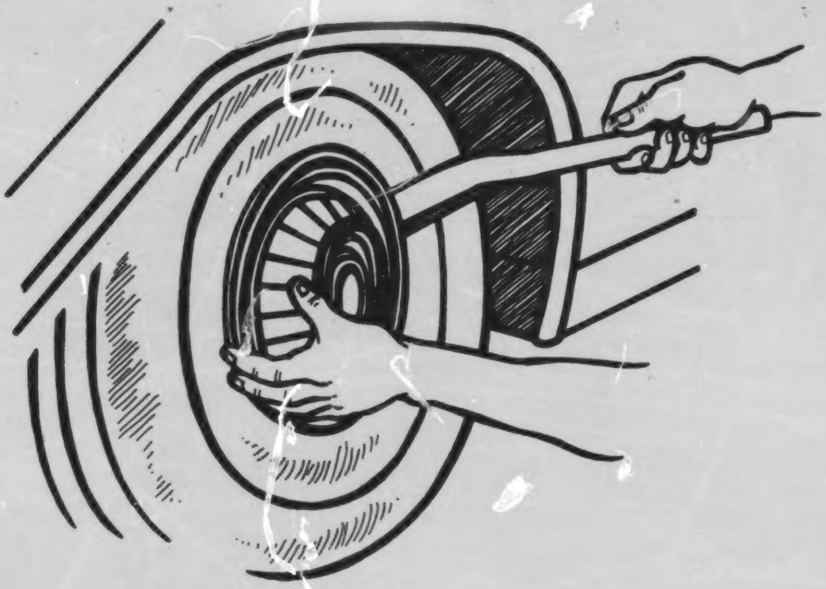
4. Remove spare tire from vehicle.



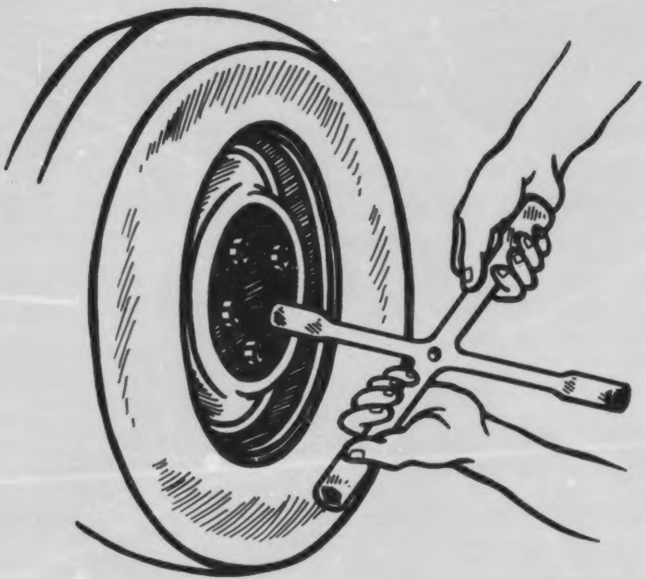

CAUTION!

Lift the tire properly to avoid injury.
Do not drop the tire.

5. Remove wheel cover from the flat tire.



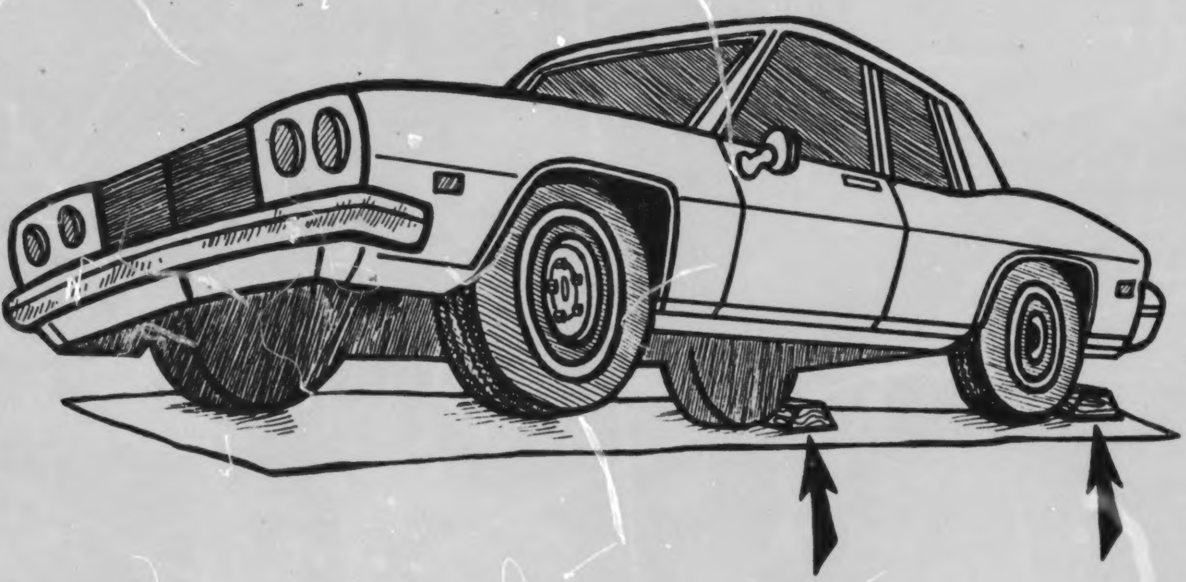
6. Loosen nuts with a lug wrench.



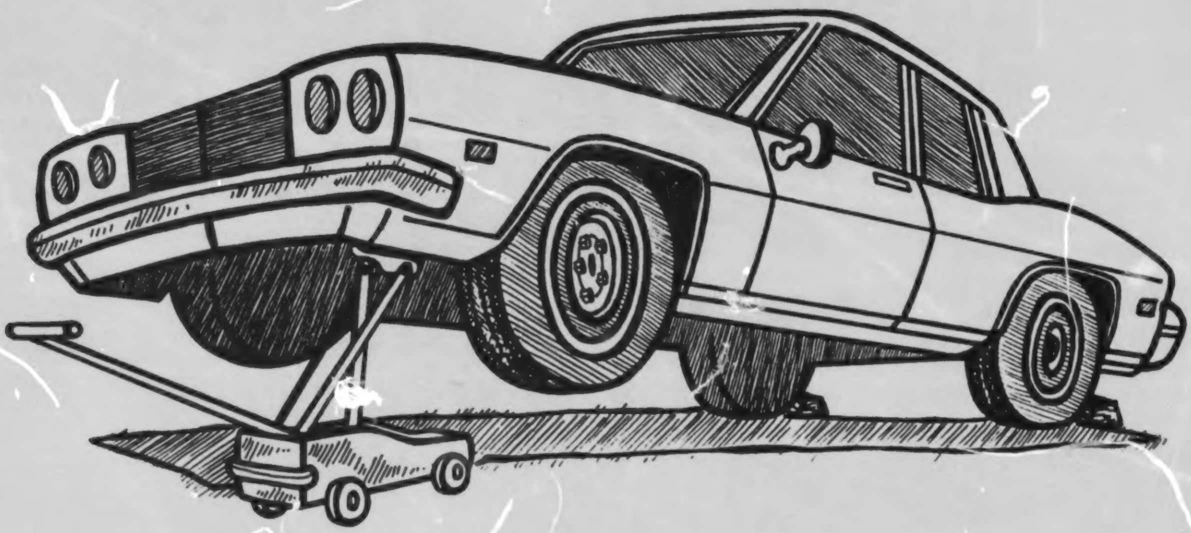
NOTE!

DO NOT remove lug nuts yet. Loosen them so that they will come off easily when the wheel is jacked up.

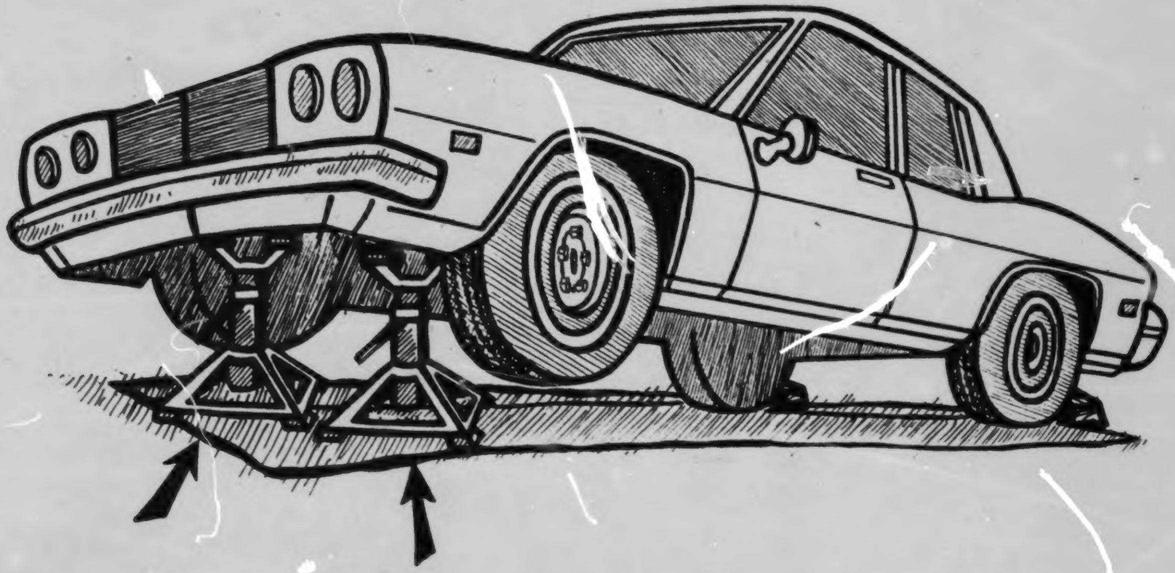
7. Block back rear wheels to prevent car from rolling.



8. Jack car up until the flat tire clears the ground by about 3 inches.

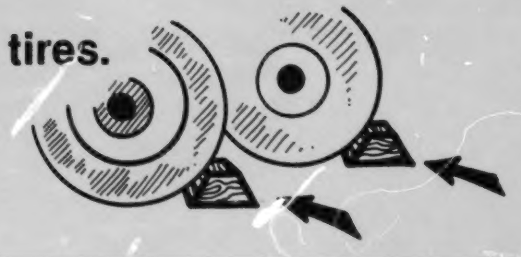


9. Support the raised end with jack stands.

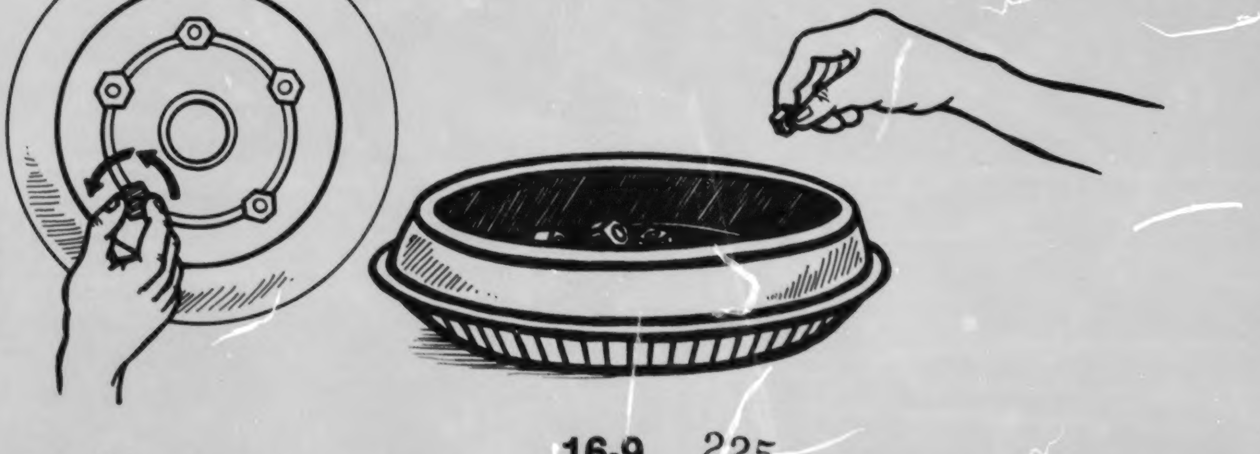


CAUTION!

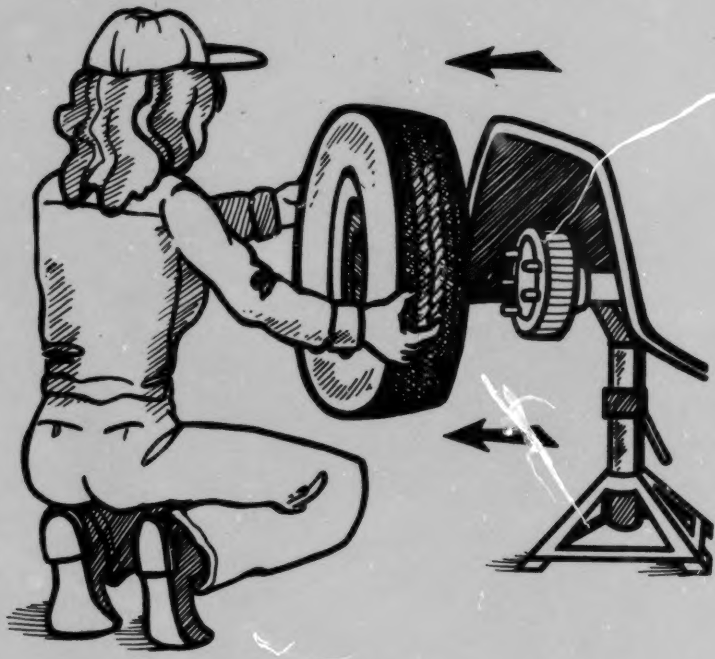
ALWAYS block the tires opposite of end being raised.
ALWAYS block both tires.



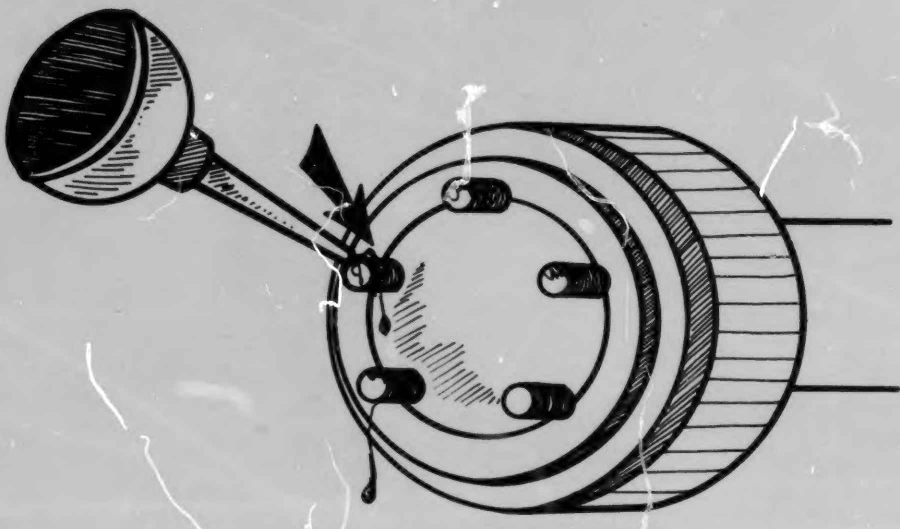
10. Remove lug nuts. Place them with wheel cover.



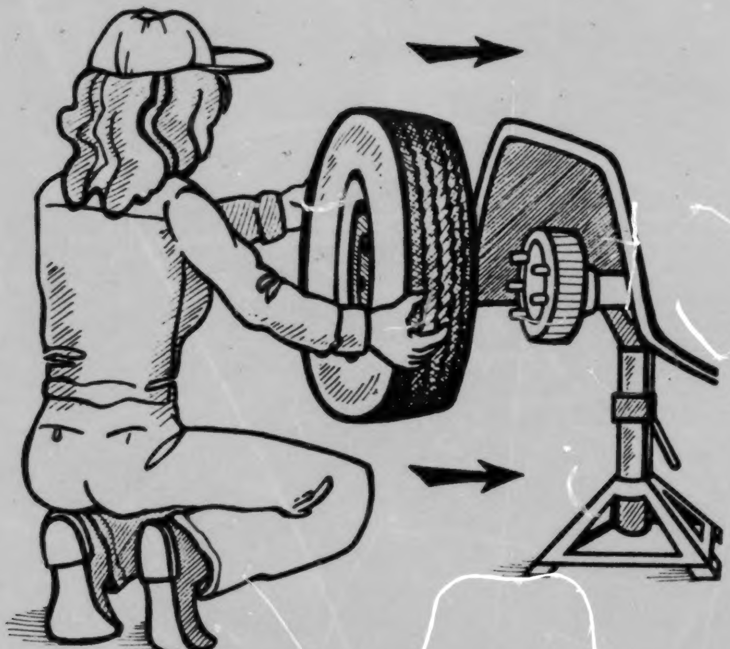
11. Remove flat tire and wheel.



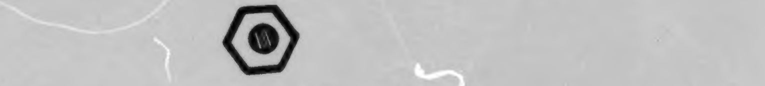
12. Apply oil to studs of wheel hub.



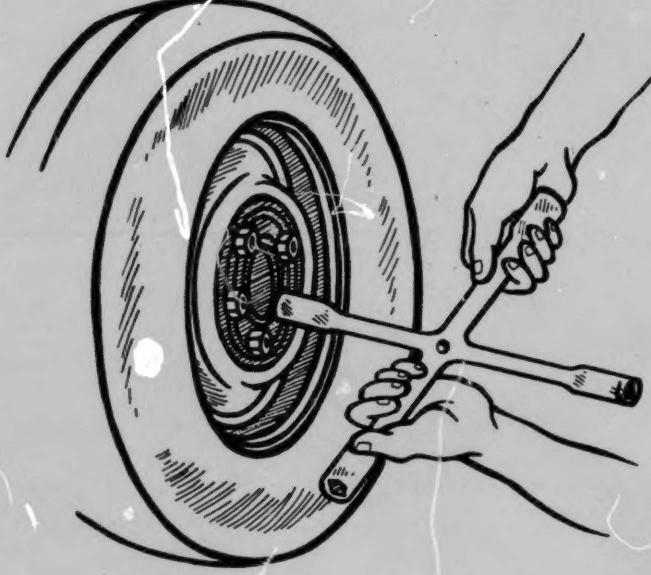
13. Mount the spare tire.

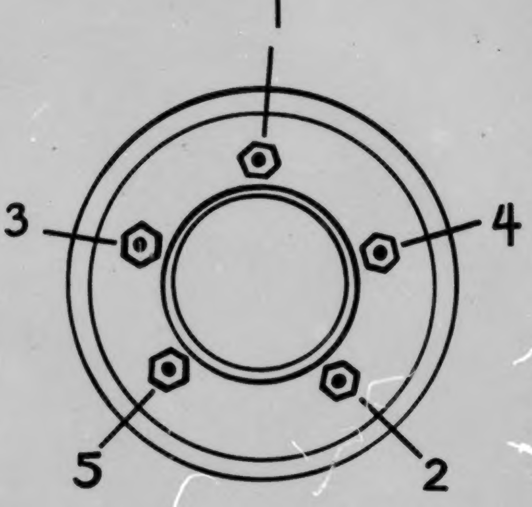


14. Screw in lug nuts by hand.



15. Tighten lug nuts with a lug wrench.

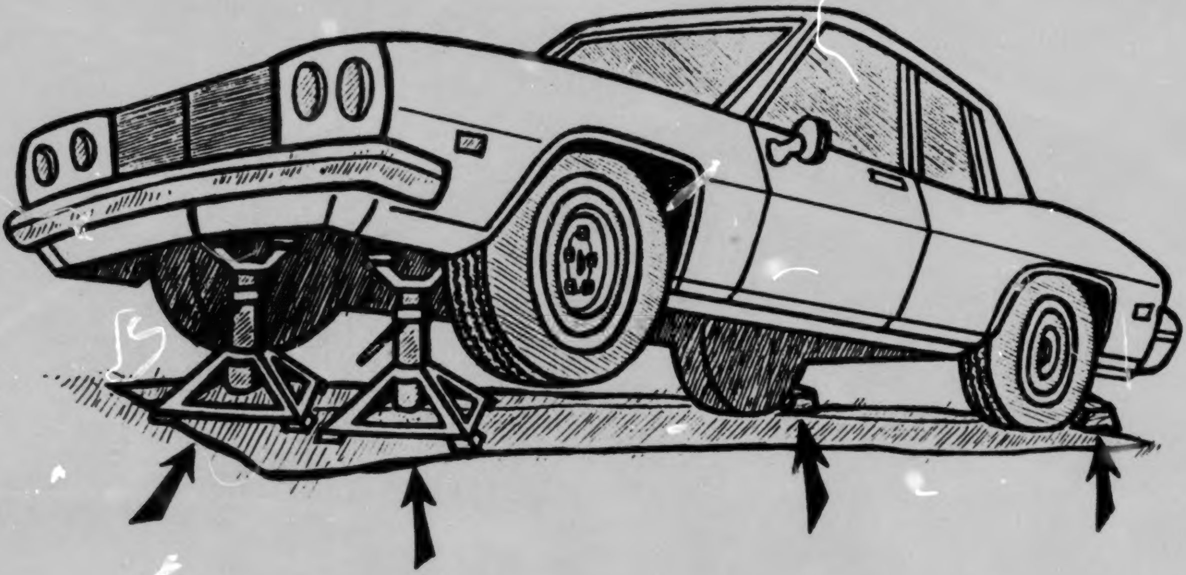




NOTE!

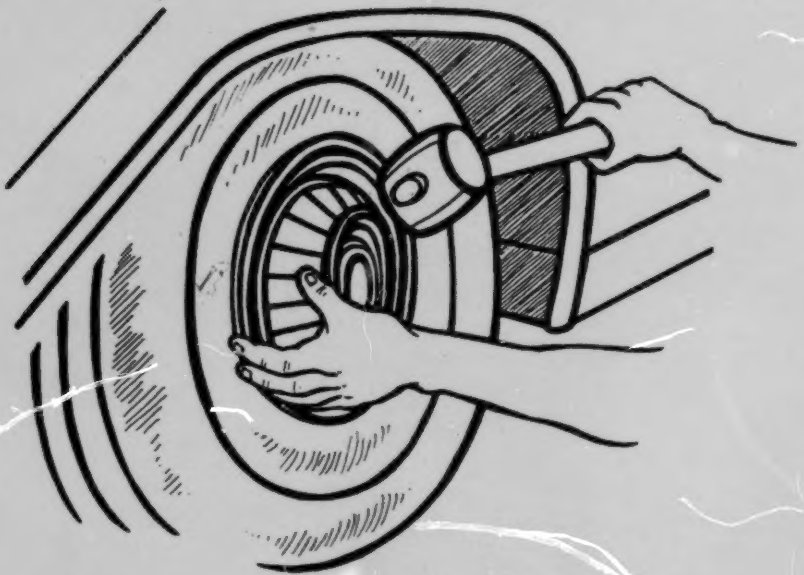
To insure the wheel will be evenly tightened on wheel hub follow this criss-cross order for tightening.

16. Remove jack stands and lower car. Remove wedge blocks from wheels.

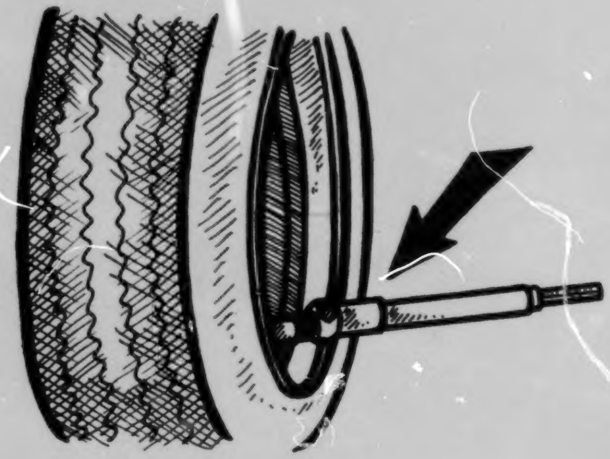


17. Complete tightening lug nuts in a criss-cross manner.

18. Replace wheel cover. Tap it in securely with rubber mallet.



19. Check tire pressure in spare tire. Add or remove air to get the correct air pressure in tire.



20. Clean your work area. Return tools to their proper places.

SEE YOUR INSTRUCTOR

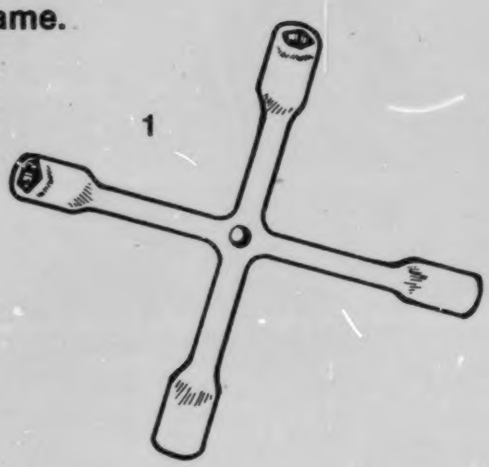
Unit 16
Changing a Tire

Tools and Materials Identification Exercise

Match the object with its correct name.

______ A. Wedge Blocks
______ B. Pry Bar
______ C. Rubber Mallet
______ D. Lug Wrench
______ E. Pressure Gauge

1



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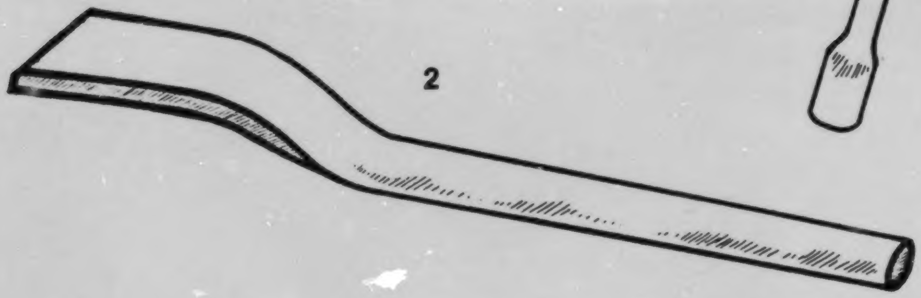

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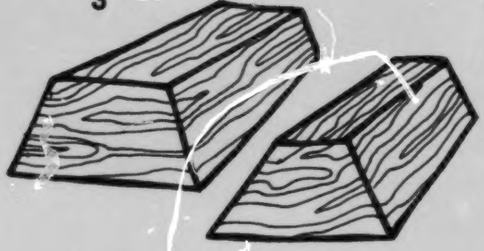

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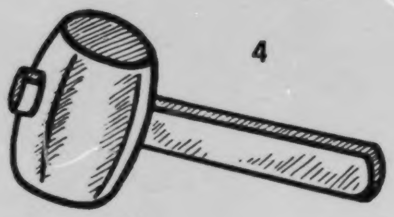

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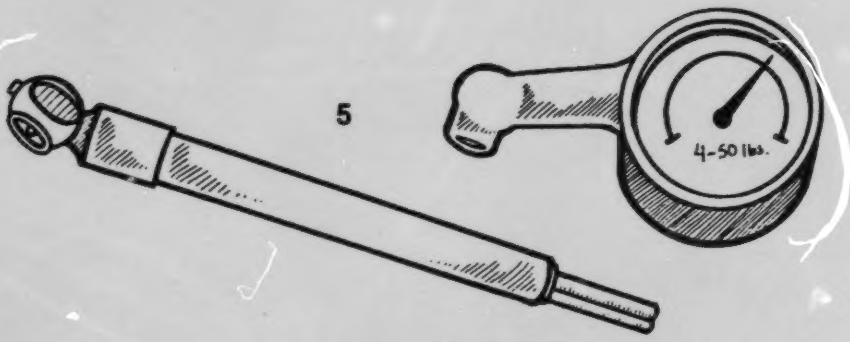


Unit 16
Changing a Tire

Practical Exercise Performance Checklist

The student ______________________ successfully performed the following tasks:

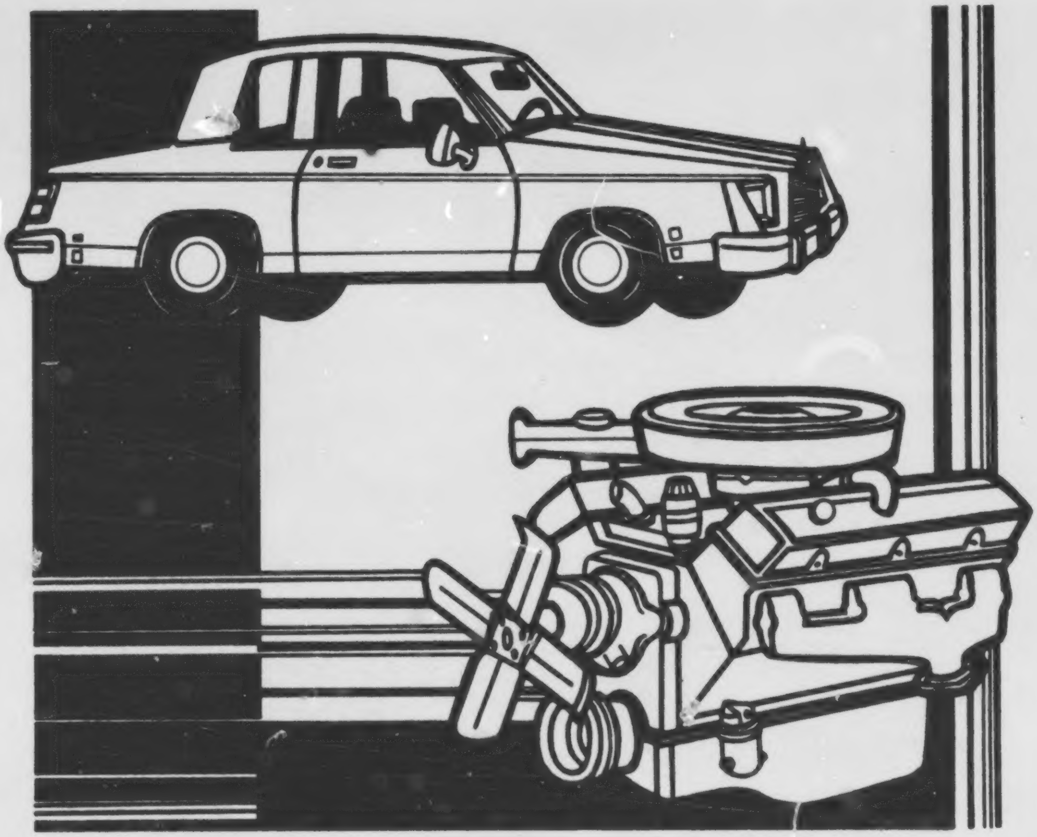
Tasks	Yes	No	Comments
1. Identified:			
a. Wedge block			
b. Pry bar			
c. Rubber mallet			
d. Lug wrench			
e. Pressure gauge			
2. Wore proper safety equipment.			
3. Set parking brake on car.			
4. Safely removed spare tire.			
5. Removed wheel cover.			
6. Correctly loosened nuts without removing them.			
7. Blocked rear tires and raised front end of the car.			
8. Supported front end of the car on jack stands.			
9. Removed lug nuts and put them in wheel cover.			
10. Pulled off flat tire.			
11. Lubricated studs of hub with engine oil.			
12. Mounted spare tire.			
13. Replaced lug nuts.			
14. Correctly tightened lug nuts with lug wrench.			
15. Removed jack stands and lowered car.			

Tasks	Yes	No	Comments
16. Tightened nuts in the proper order.			
17. Replaced wheel cover.			
18. Gauged and adjusted tire pressure.			
19. Cleaned work area and return tools to their proper places.			

Satisfactory Performance ☐
Repeat Exercise ☐
Should Move On ☐

Instructor's Signaure Date

Vocational Preparation Curriculum
AUTO SERVICE



Unit 17

Rotating Tires

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION

IML

INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

Unit 17
Rotating Tires

Rotating Tires

After you study this lesson, you should be able to:

1. Identify tools, materials and equipment used to rotate tires.
2. Correctly rotate tires.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

   SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

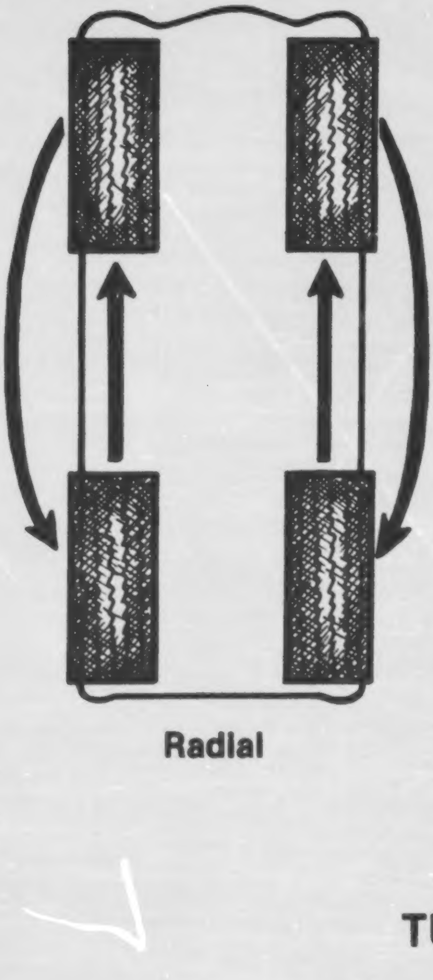
   TURN THE PAGE AND BEGIN

Unit 17
Rotating Tires

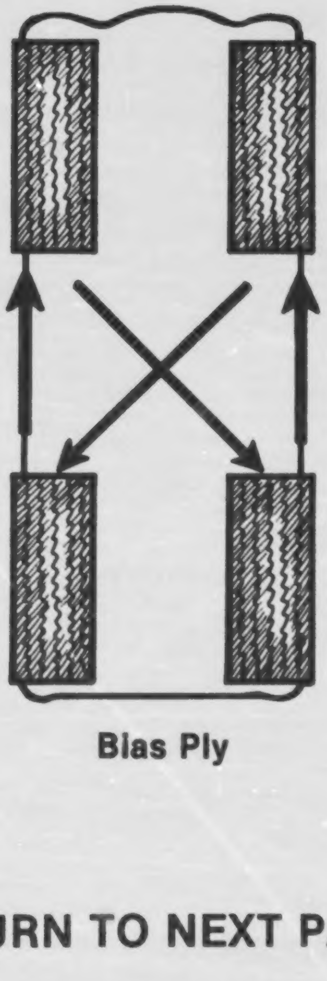
Introduction

When a car is driven, tires do not wear evenly. Rotation allows tires to wear more evenly and last longer. Manufacturers recommend that tires be rotated every 5,000 miles. Radial tires must be kept on the same side of the car. Bias ply tires may be crossed.

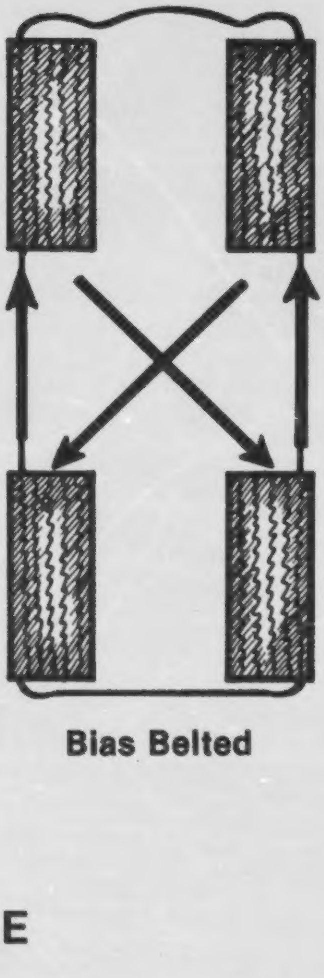
In this unit, you will learn how to rotate four radial tires in their correct order.



Radial



Bias Ply



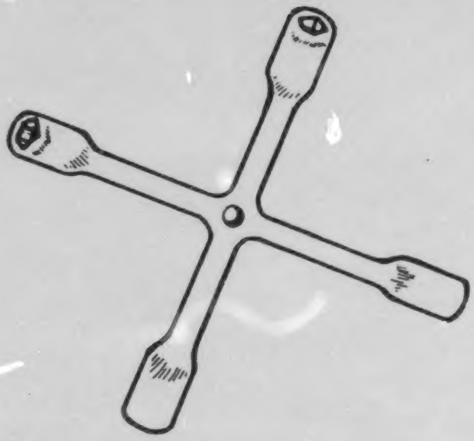
Bias Belted

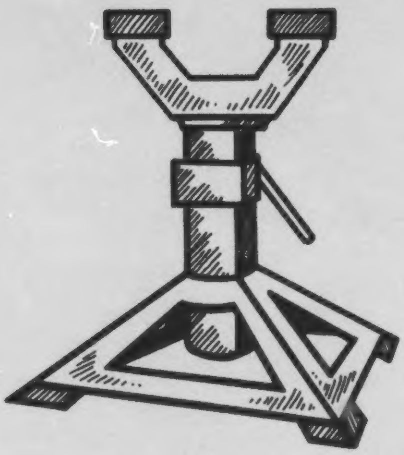
TURN TO NEXT PAGE

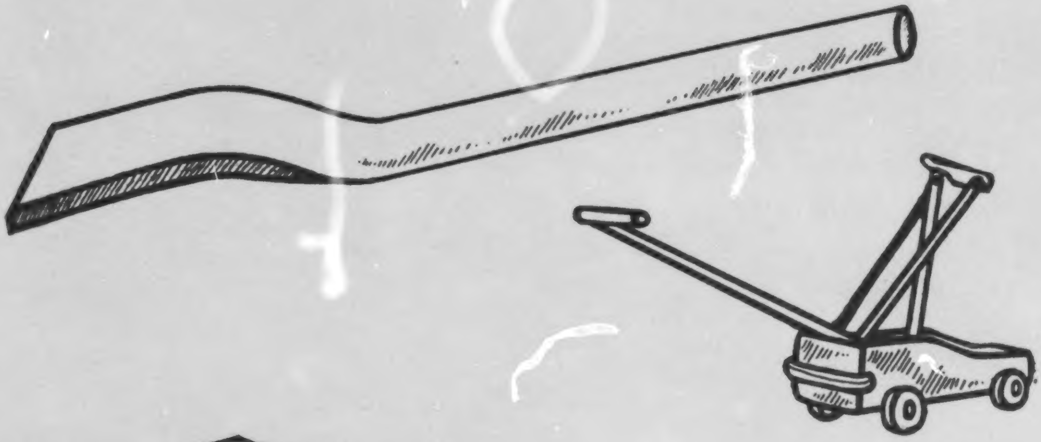
Unit 17
Rotating Tires

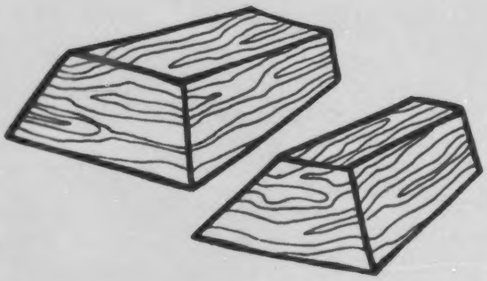
A. Tools, Materials and Equipment for Rotating Tires.

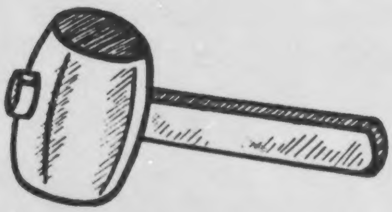
You will use the same tools in this unit that you used to change a flat tire.





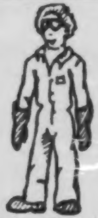


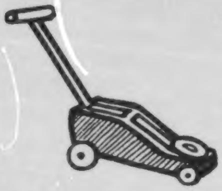


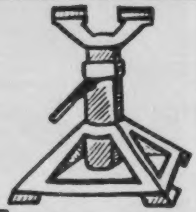


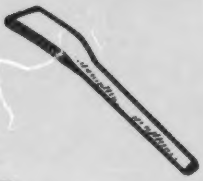
B. Steps for Rotating Tires.

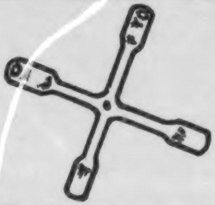
1. Find and Check Off the following:

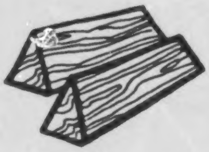

☐ Safety Equipment

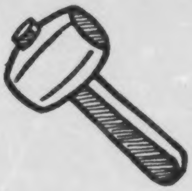

☐ Floor Jack


☐ Jack Stands

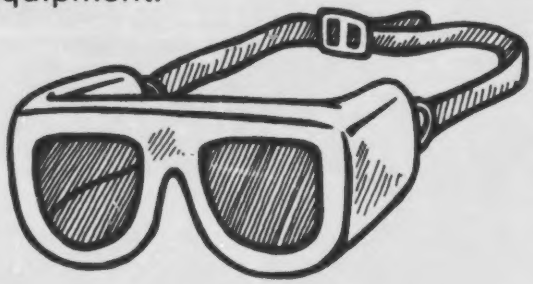

☐ Pry Bar


☐ Lug Wrench

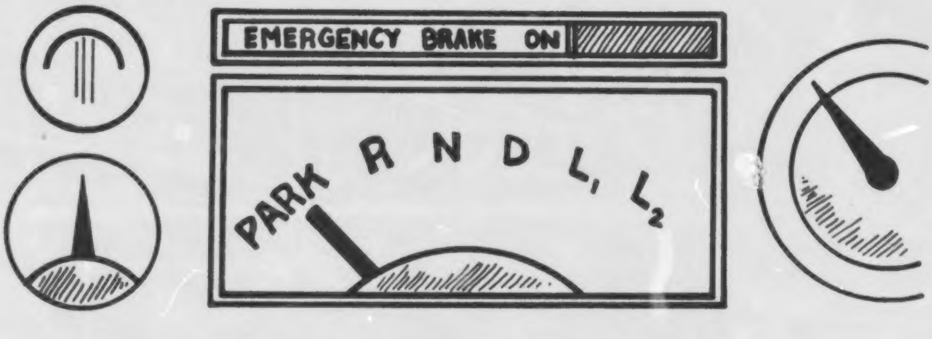

☐ Wedge Block


☐ Rubber Mallet

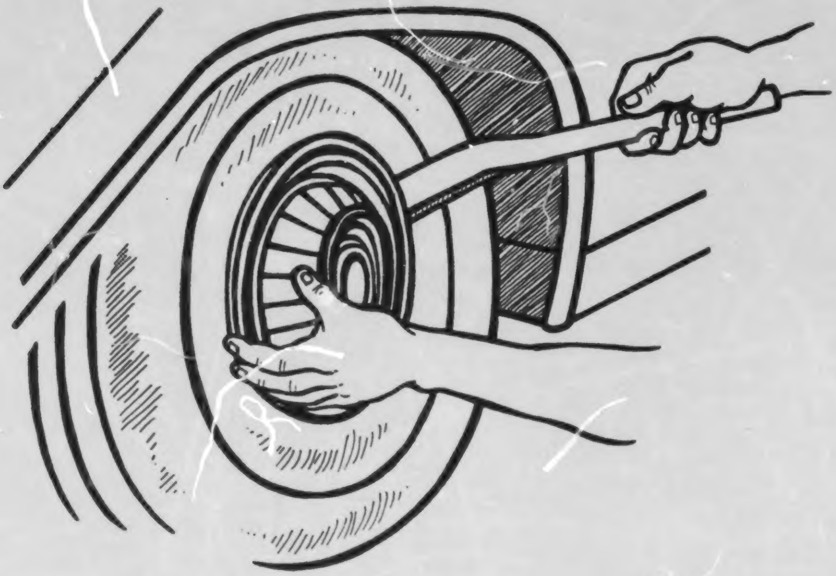
2. Wear proper safety equipment.



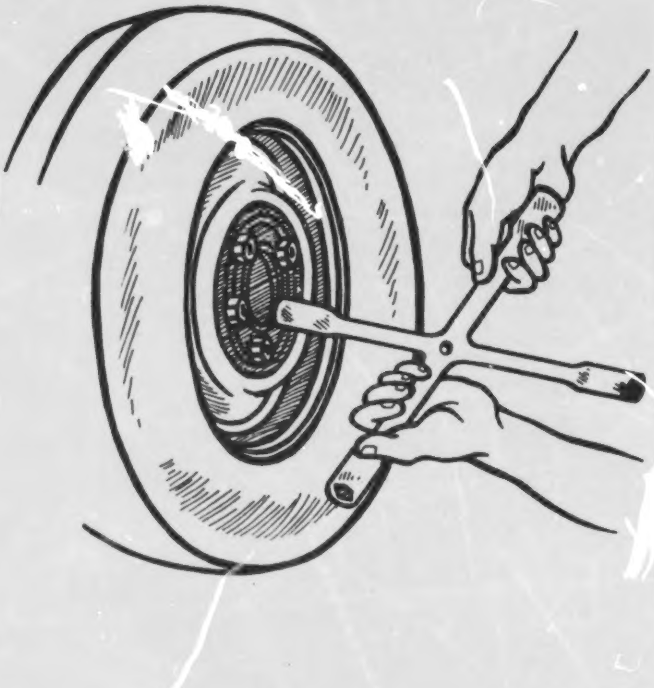
3. Set parking brake.


EMERGENCY BRAKE ON
PARK
R
N
D
L_1
L_2

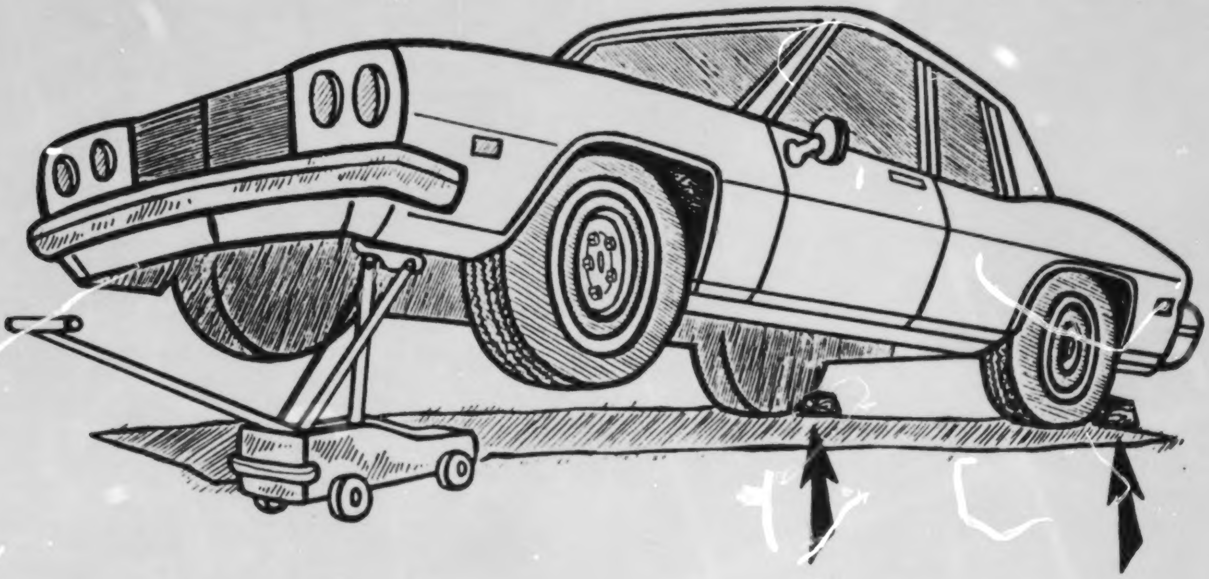
4. Remove wheel covers.



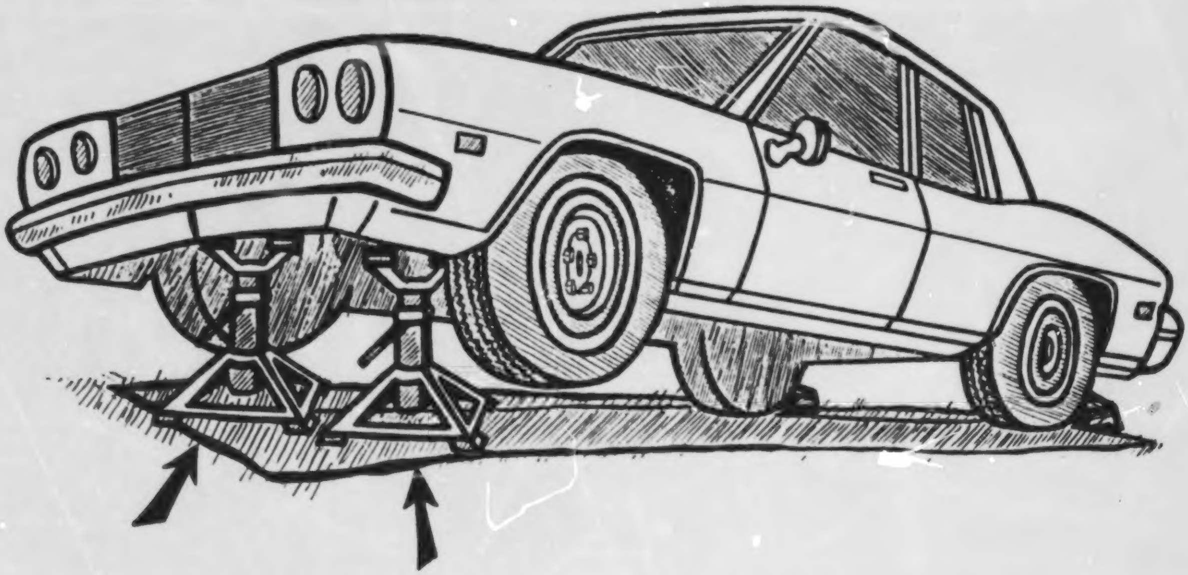
5. Loosen lug nuts on all four tires. Do not remove them from wheel.



6. Block rear tires and jack up front end of vehicle.

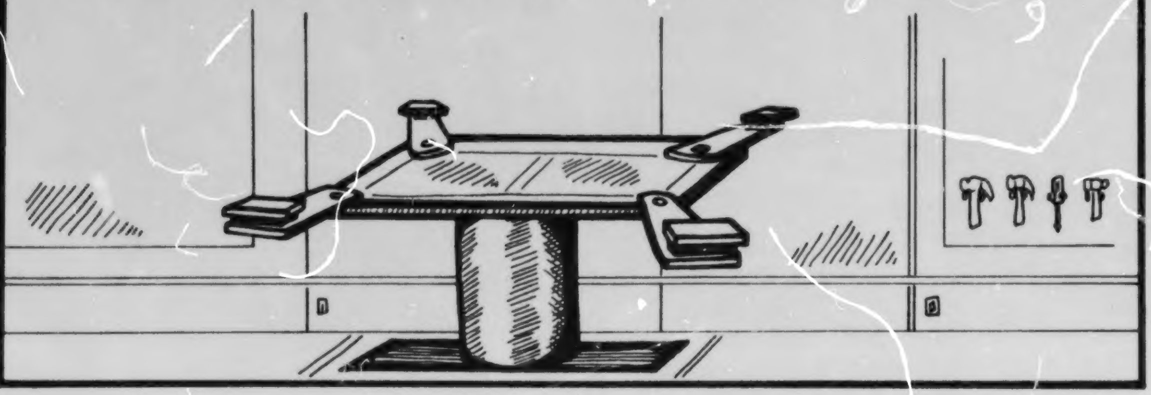


7. Support front of vehicle on jack stands.

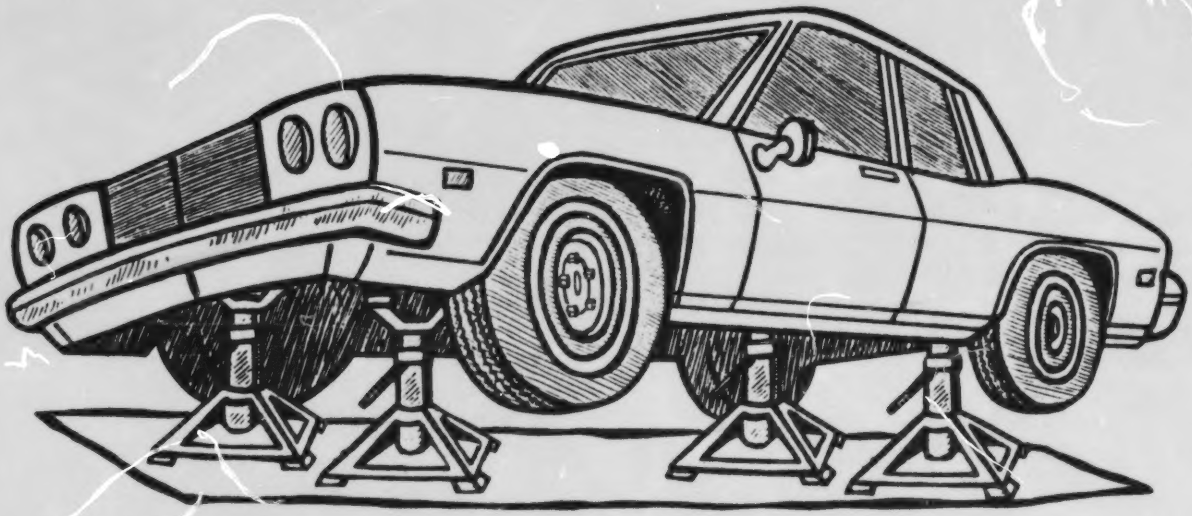


NOTE!

HYDRAULIC LIFT: Can be used to raise the entire automobile.

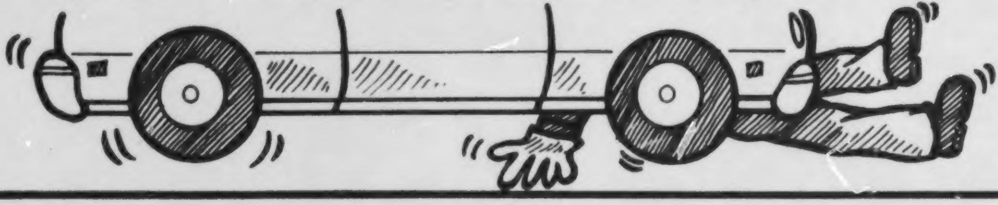


8. Jack up rear of vehicle and support it on jack stands.

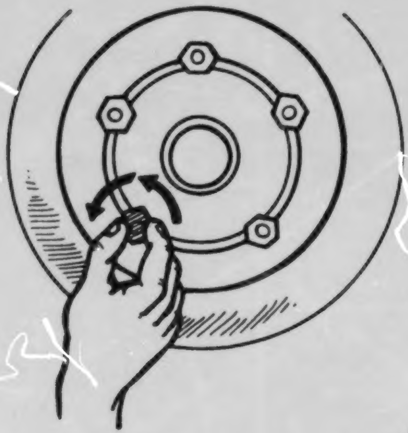


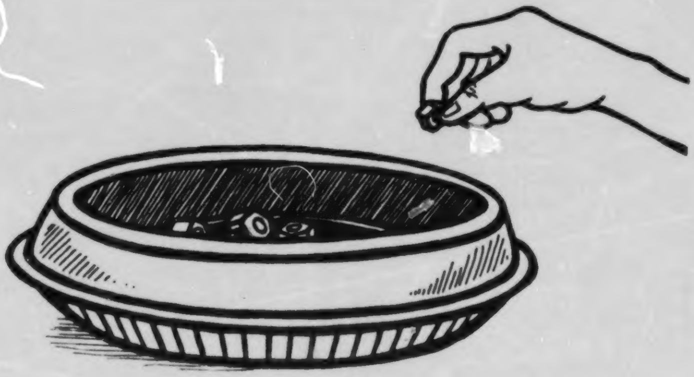
CAUTION!

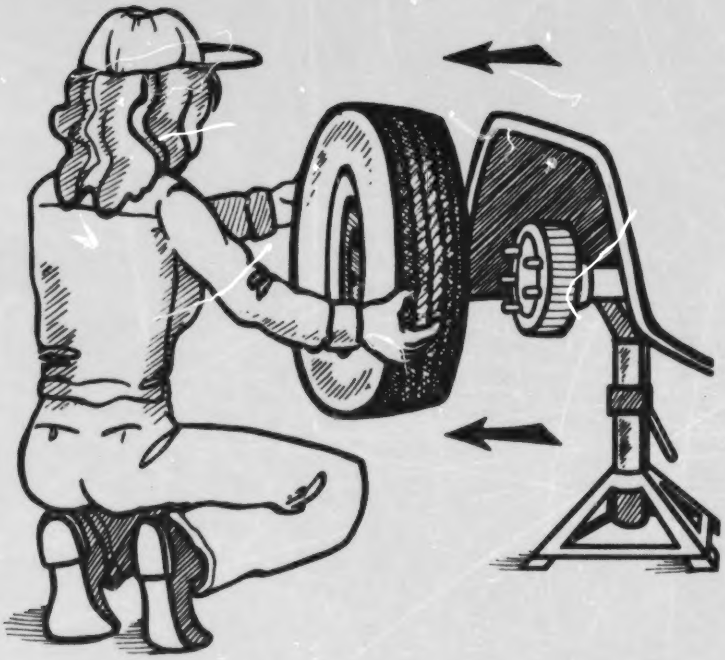
NEVER work under a raised car that is not supported on jack stands. You can be severely injured or killed if the car falls on you.



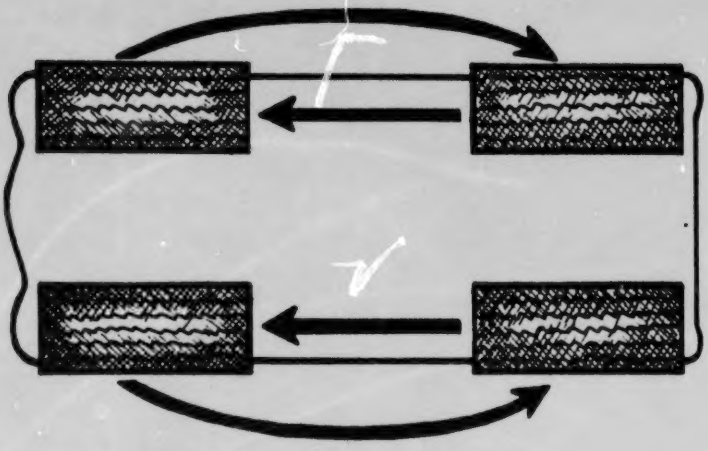
9. Remove lug nuts from each wheel. Put them in the wheel cover. Remove each tire and wheel.





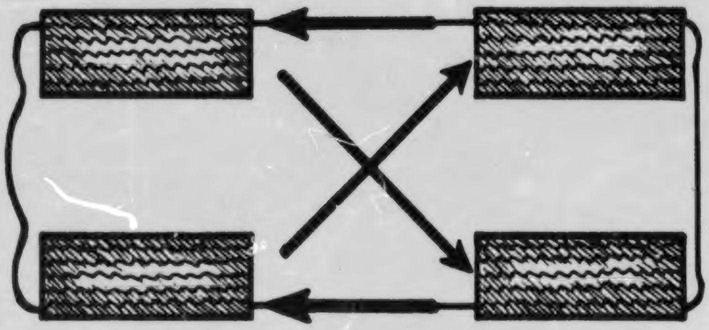


10. Rotate radial tires correctly.



NOTE!

Bias tires are rotated different than radial tires.



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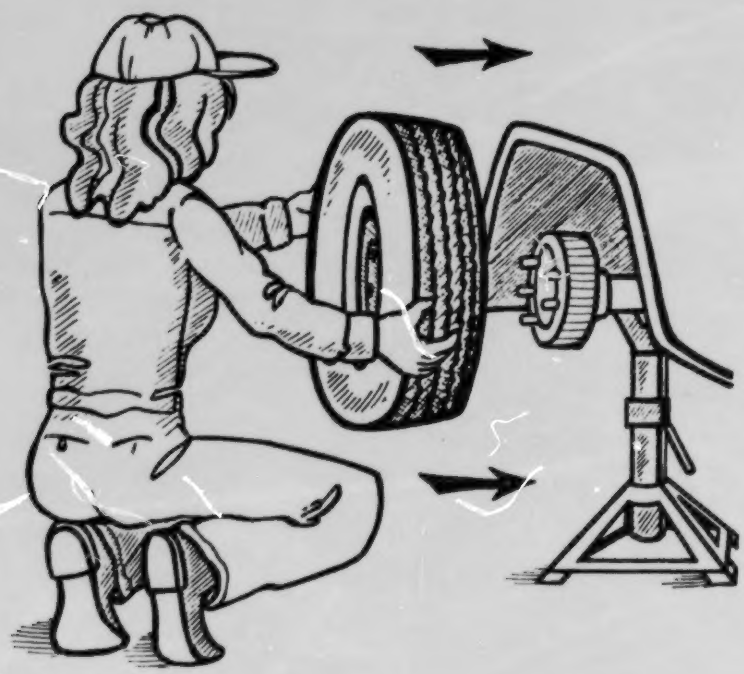
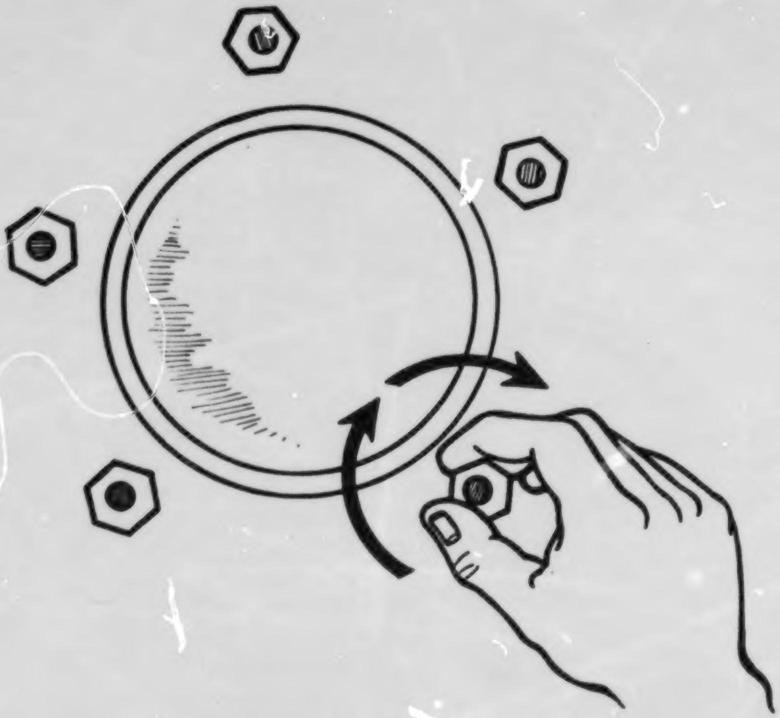
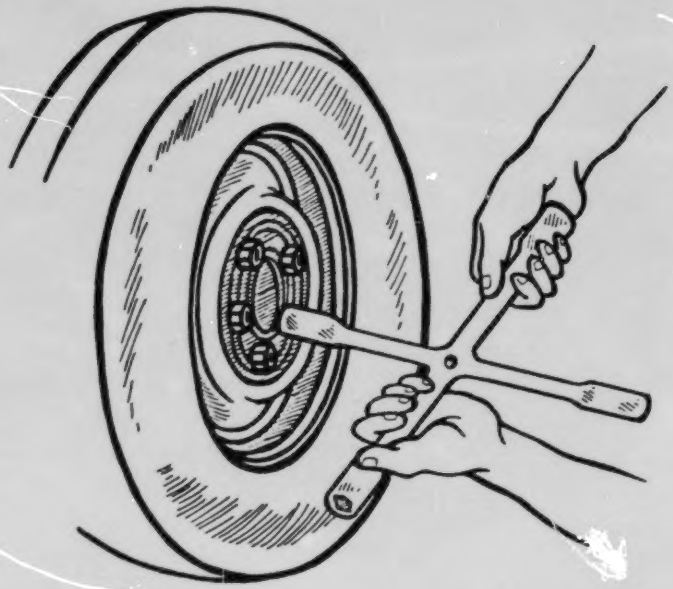
11. Mount each tire and wheel on the studs in its new position.

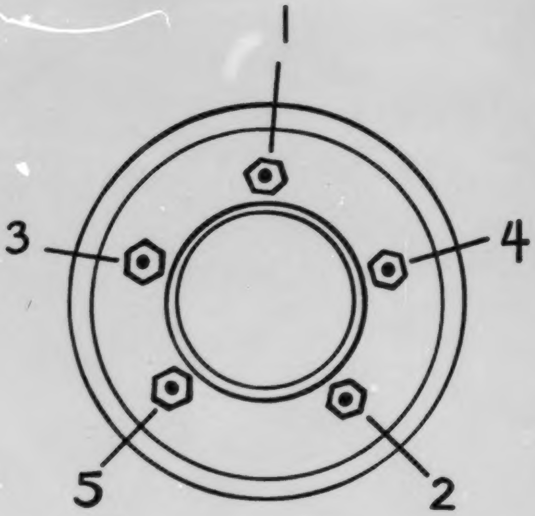


12. Tighten lug nuts by hand to hold each tire and wheel assembly in place.

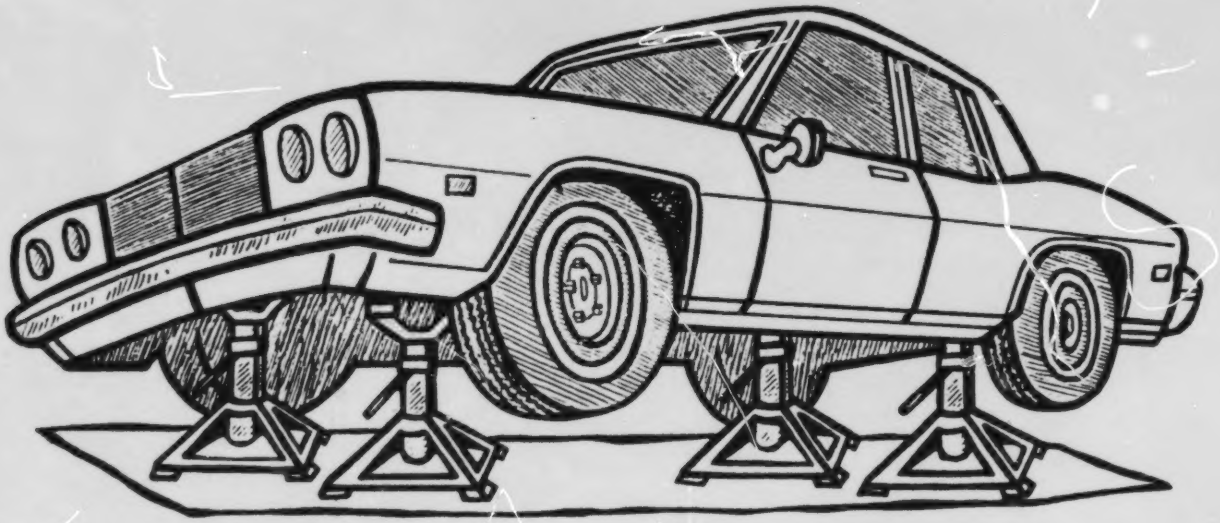


13. Tighten lug nuts on all four tires with lug wrench until the tire turns.



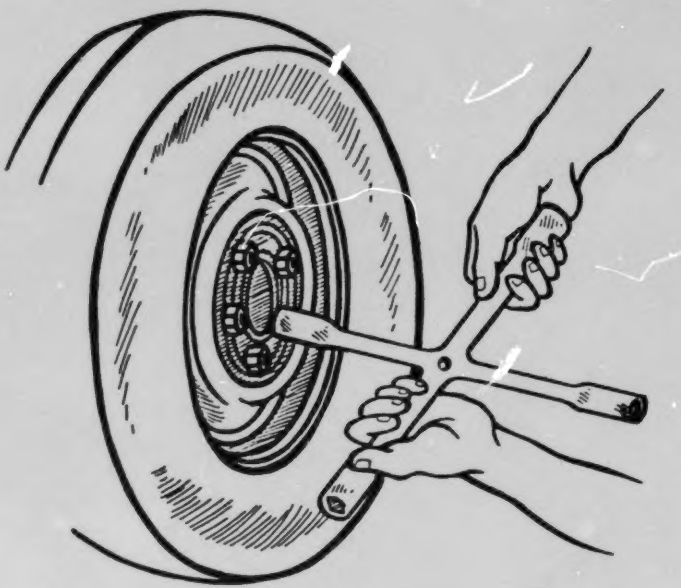


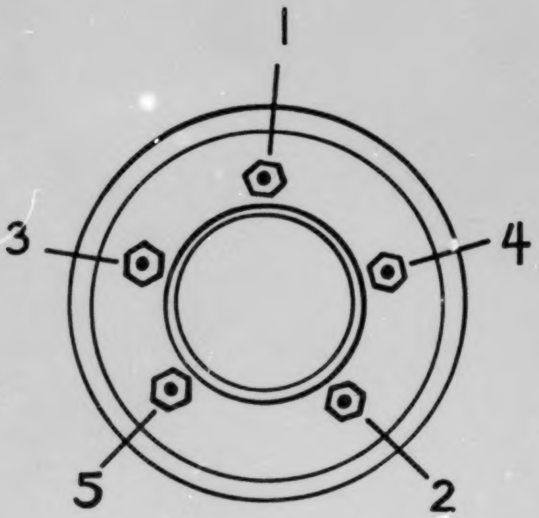
14. Remove jack stands from rear of car and lower it to the ground.



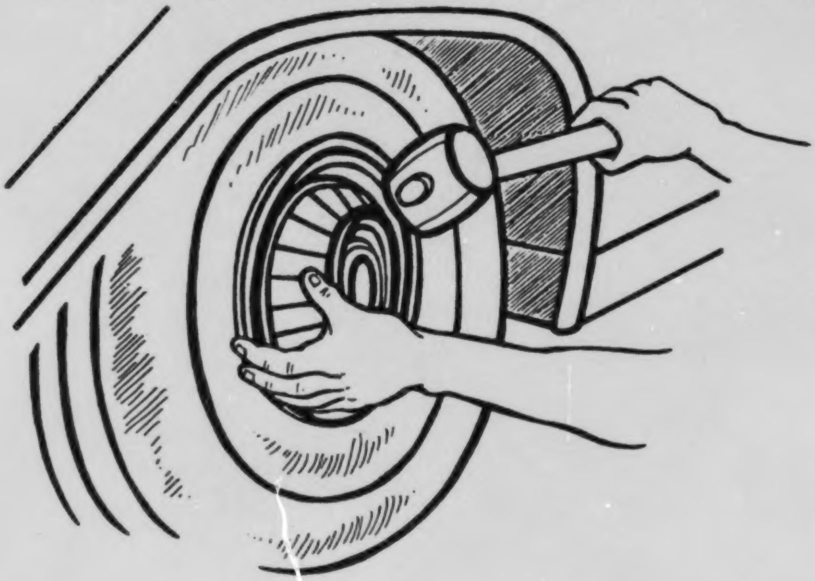
Remove front jack stands and lower the front to the ground.

15. Complete tightening lug nuts on each tire. Remember to tighten them in the proper order.





16. Replace wheel cover on each wheel. Tap with rubber mallet.



17. Clean your work area and return tools to their proper places.

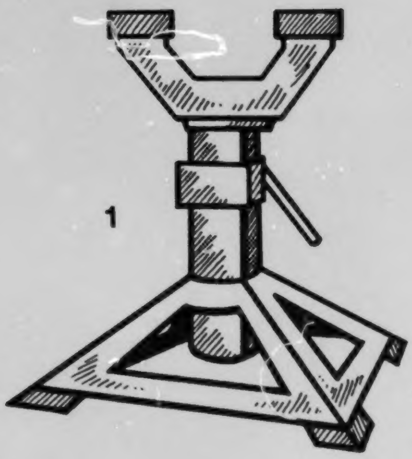
SEE YOUR INSTRUCTOR

Unit 17
Rotating Radial Tires

Tools and Materials Identification Exercise

Match each object with the correct words provided:

_____A. Car Jack
_____B. Jack Stands
_____C. Wedge Blocks
_____D. Pry Bar
_____E. Rubber Mallet
_____F. Lug Wrench
_____G. Oil Can



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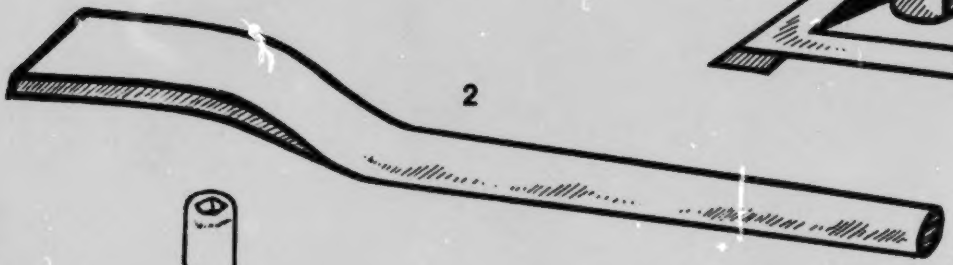

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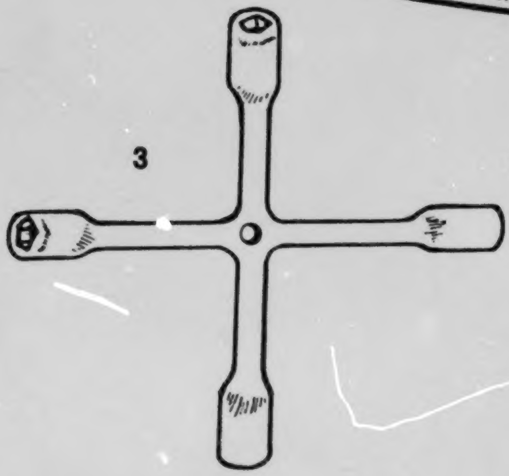

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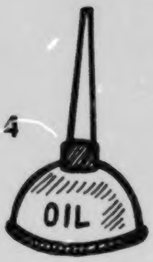

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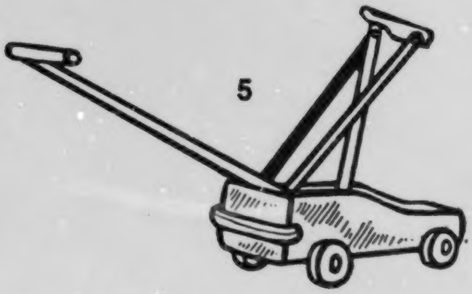

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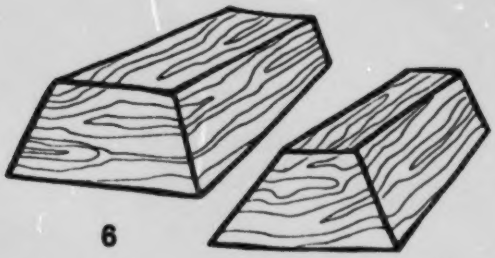

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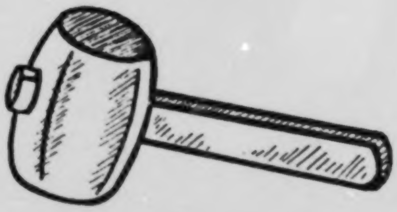

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Unit 17
Rotating Tires

Practical Exercise Performance Checklist

The student ____________________ successfully performed the following tasks:

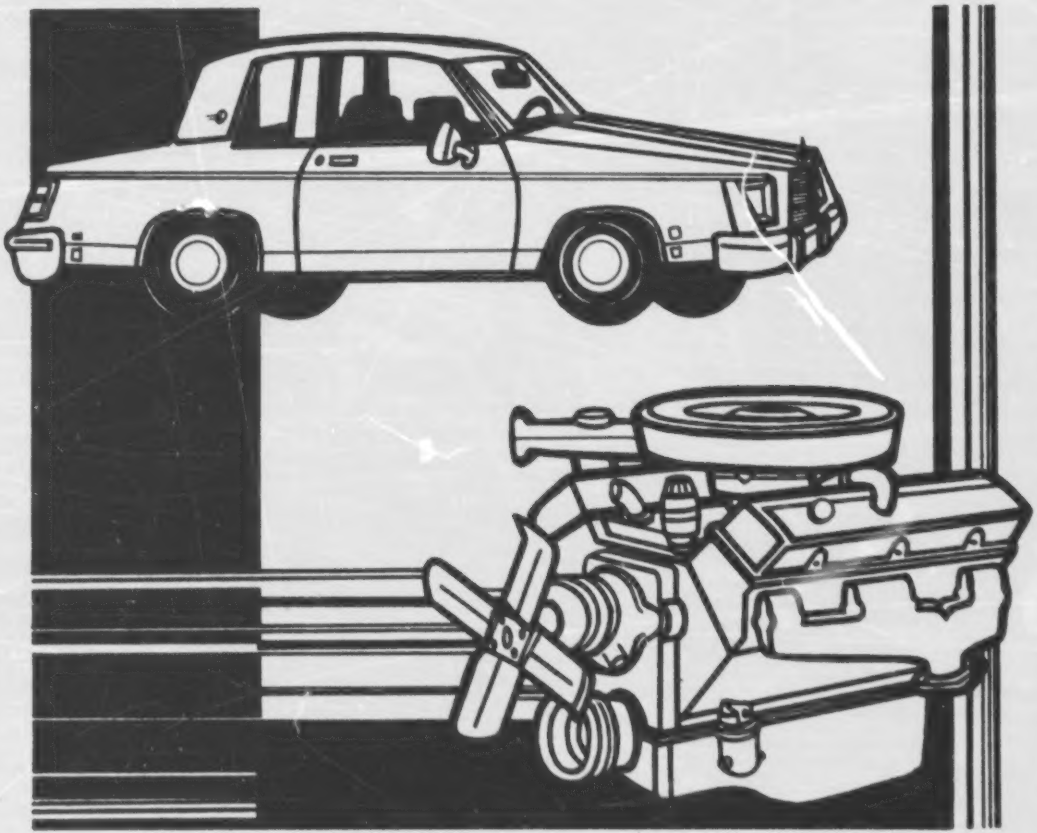
Tasks	Yes	No	Comments
1. Identified:			
a. Car jack			
b. Jack stand			
c. Wedge blocks			
d. Screw driver			
e. Rubber mallet			
f. Lug wrench			
2. Wore proper safety equipment.			
3. Set the parking brake.			
4. Correctly removed wheel cover.			
5. Correctly loosened lug nuts on each wheel without removing them.			
6. Blocked rear tires and raised front end of car.			
7. Supported front end of car on jack stands.			
8. Jacked up rear of the car on jack stands.			
9. Removed lug nuts from each wheel and placed them in wheel cover.			
10. Removed tire and wheel.			
11. Correctly rotated tires.			
12. Mounted each tire and wheel on the stud.			
13. Correctly tightened lug nuts.			

Tasks	Yes	No	Comments
14. Removed jack stands from car and lowered to the ground.			
15. Correctly tightened lug nuts on each wheel.			
16. Replaced wheel cover on each wheel.			
17. Cleaned work area and returned tools to their proper places.			

Satisfactory Performance ☐
Repeat Exercise ☐
Should Move On ☐

Instructor's Signature　　Date

Vocational Preparation Curriculum
AUTO SERVICE



Unit 18

Repairing a Tubeless Tire - Plugging Method

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION
IML
INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI COLUMBIA

Unit 18
Repairing a Tubeless Tire - Plugging Method

Repairing a Tubeless Tire - Plugging Method

After you study this lesson, you should be able to:

1. Identify tools, materials and equipment used in plugging a tubeless tire.
2. Locate a puncture in a tire.
3. Repair a tubeless tire by plugging.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

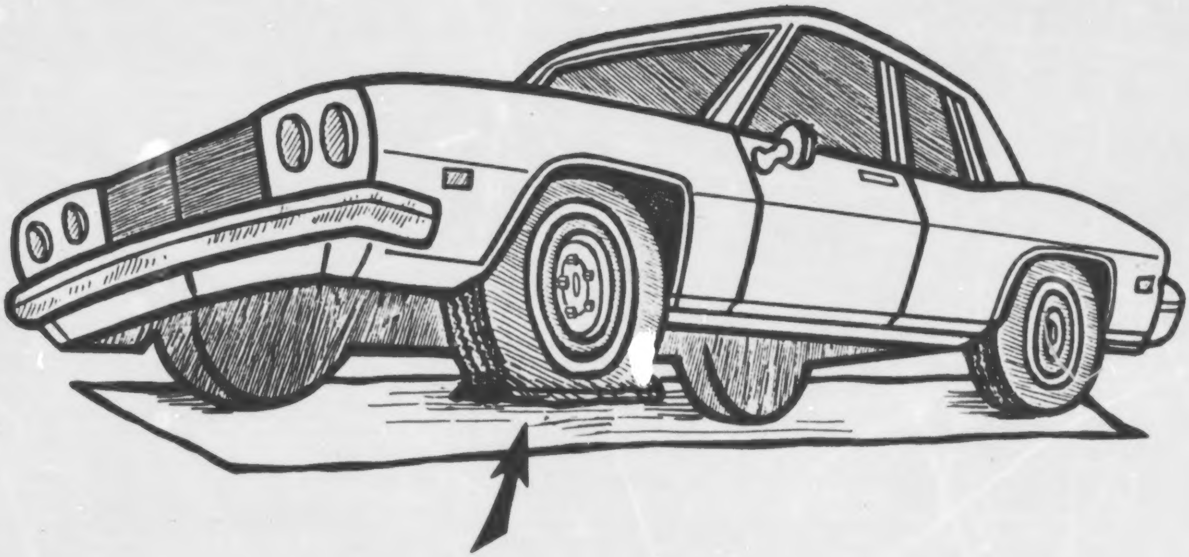
TURN THE PAGE AND BEGIN

Unit 18
Repairing a Tubeless Tire - Plugging Method

Introduction

A common car problem is a flat tire. Many times a flat is caused by some object puncturing the tire and causing all the air to escape.

In this lesson, you will learn how to repair a punctured tire by plugging the hole. Tire repair is an important skill to learn.



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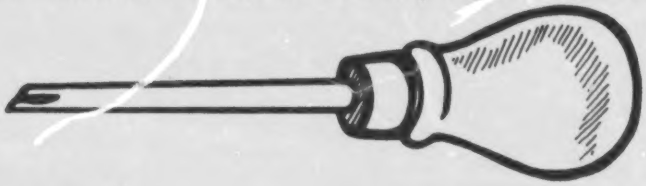
Unit 18

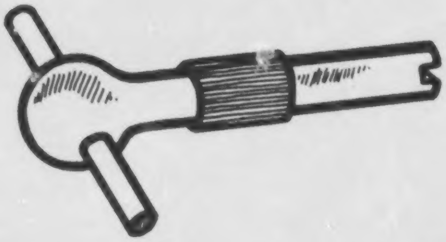
Repairing a Tubeless Tire - Plugging Method

A. Tools, Materials and Equipment for Repairing a Tubeless Tire - Plugging Method.

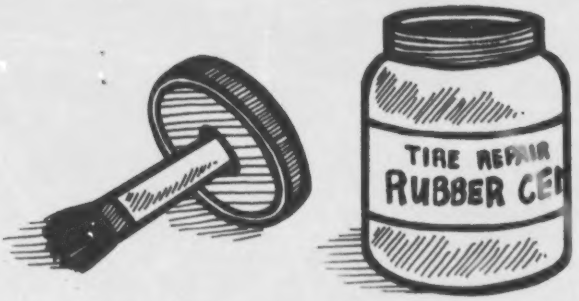
1. **PLUG NEEDLE:** Used to insert a rubber plug into a tire puncture.



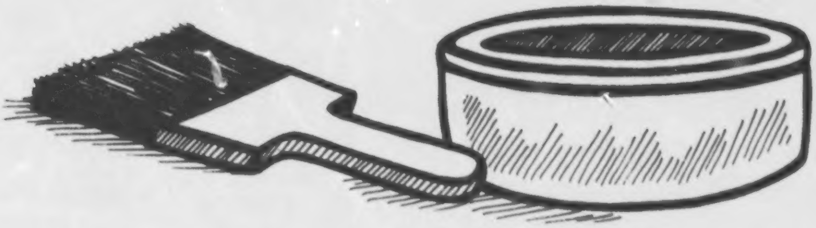
2. **VALVE CORE REMOVER:** Used to remove valve core from valve stem.



3. **RUBBER CEMENT:** Used to lubricate tire puncture and plug.



4. **SOAP SOLUTION:** Applied to an inflated tire to locate a puncture.



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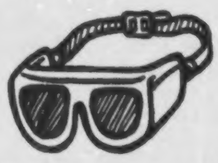
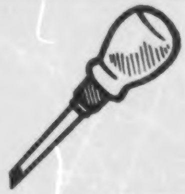
B. Steps for Repairing a Tubeless Tire - Plugging Method.

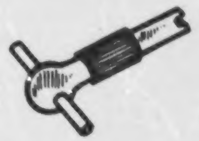
1. Find and Check Off the following:



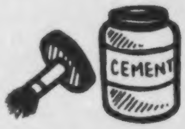
☐ Safety Equipment



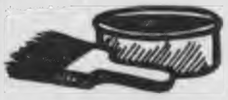
☐ Plug Needle



☐ Valve Core Remover



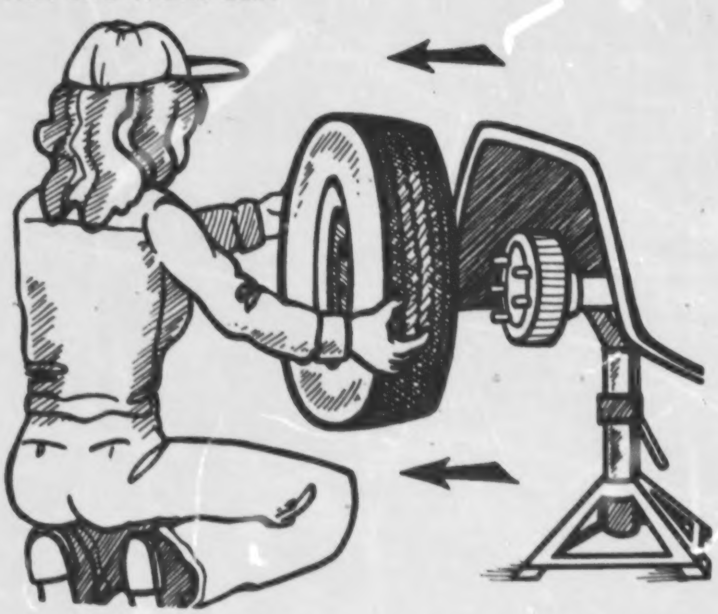
☐ Rubber Cement



☐ Soap Solution

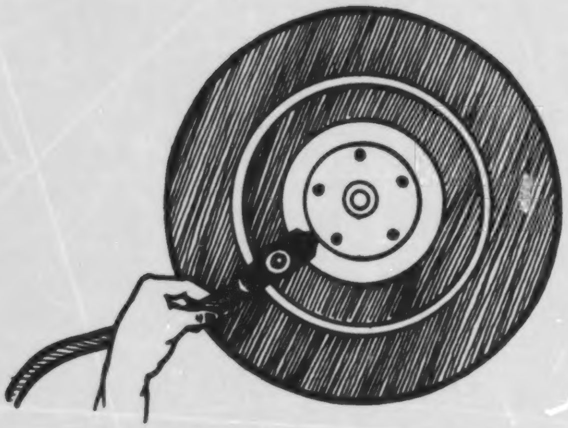
2. Wear proper safety equipment.

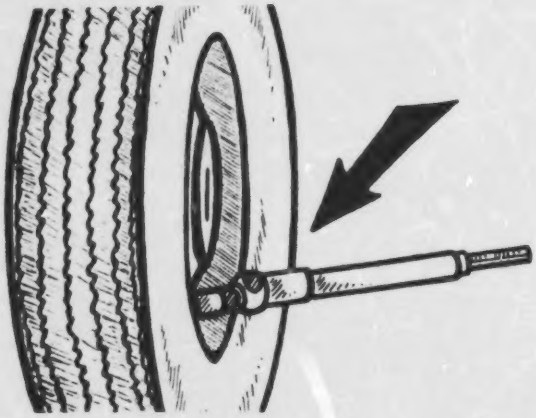
3. Remove flat tire from car.



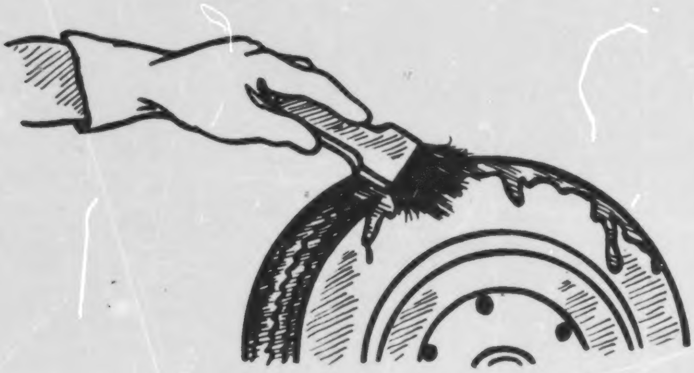
Follow the correct and safe steps for removing a tire.

4. Inflate tire, check air pressure with pressure gage.

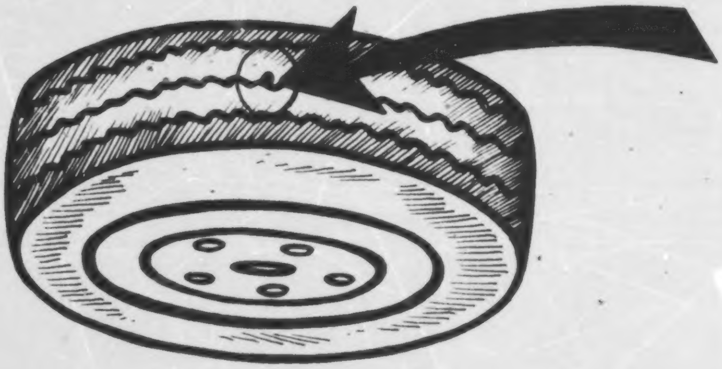




5. Apply soap solution around the tire. Air bubbles will appear where there is a puncture or leak.



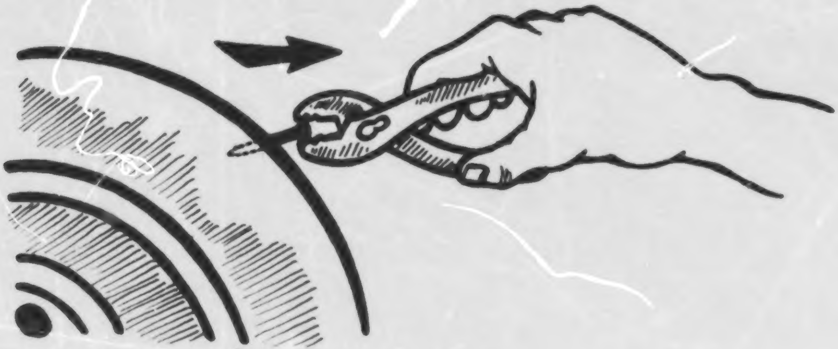
6. Mark the leak with a grease pencil or chalk.



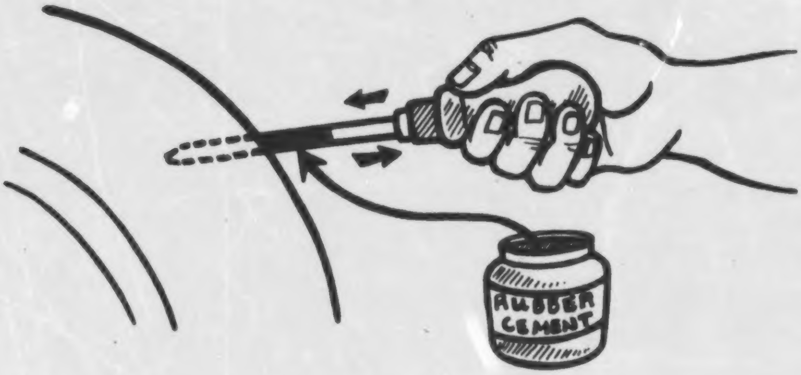
NOTE!

A rubber plug repair is only a temporary repair. Whenever possible use a tire patch inside the tire.

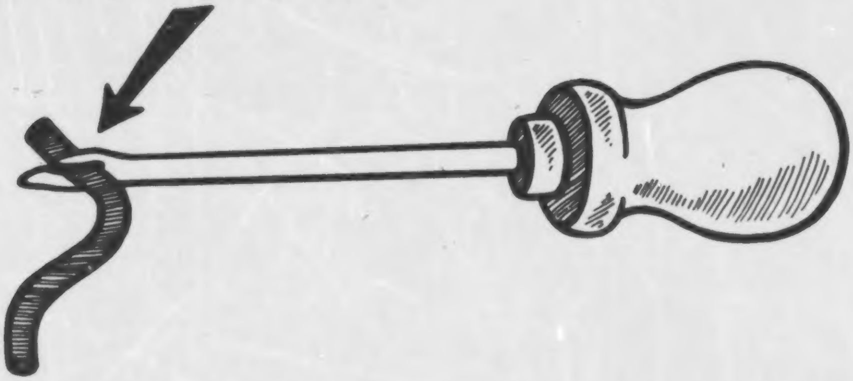
7. Check hole and remove object which punctured tire.



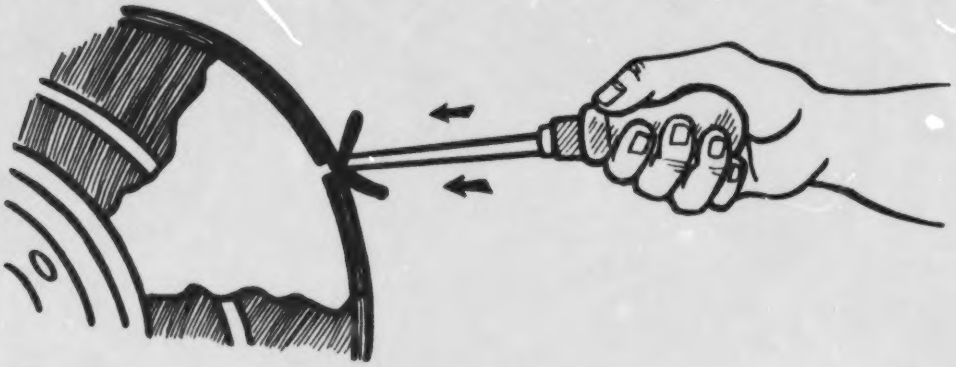
8. Clean puncture and lubricate it with rubber cement.



9. Insert rubber plug into plug needle.



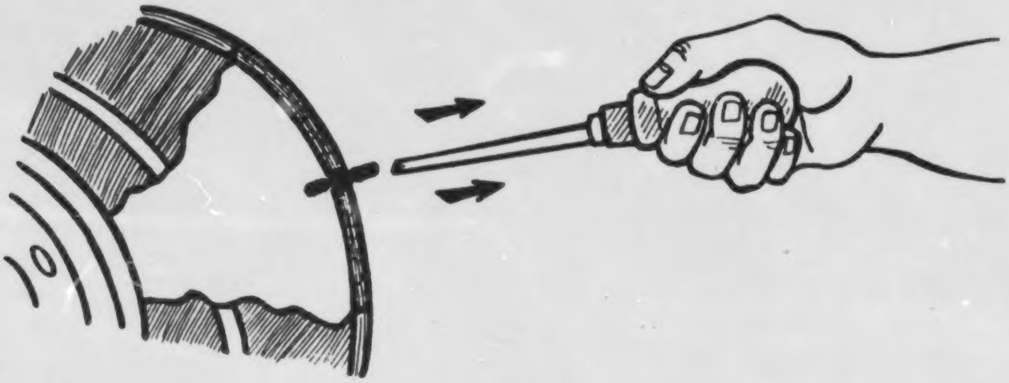
10. Pass needle and rubber plug through puncture.



NOTE!

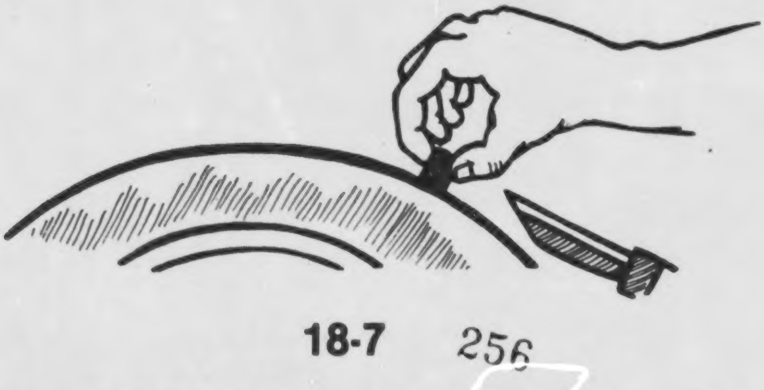
Be sure a portion of the rubber plug remains outside the tire.

11. Pull needle from puncture straight out.



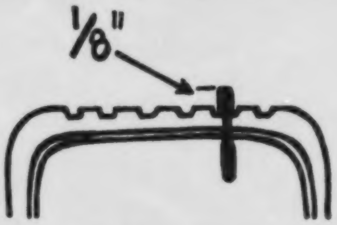
The rubber plug will unhook from inside the tire.

12. Cut off excess plug, leaving about 1/8" above the tire tread.

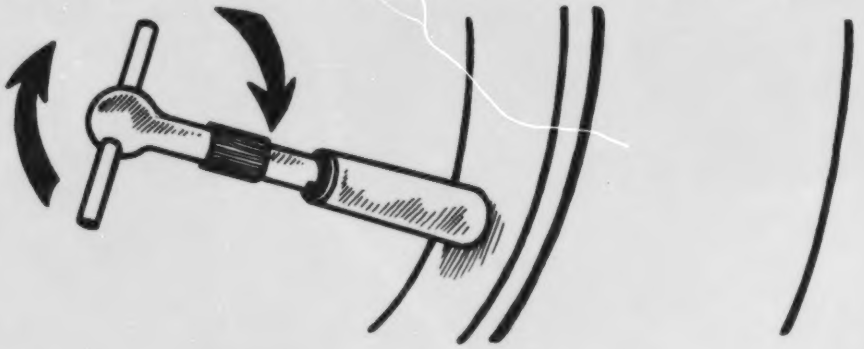


NOTE!

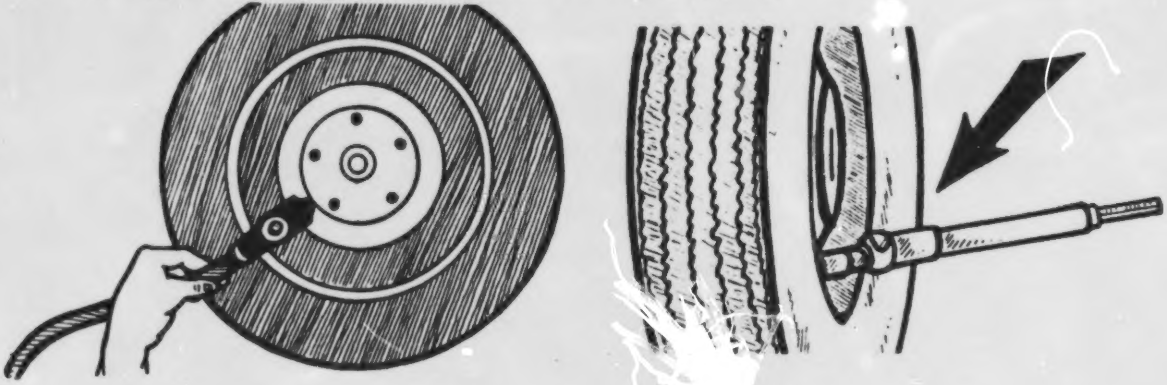
A correctly installed rubber plug will look like this.



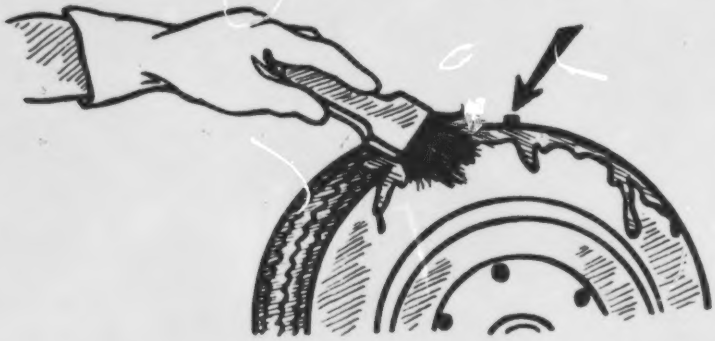
13. Check the valve stem. Tighten it firmly with the valve core tool.



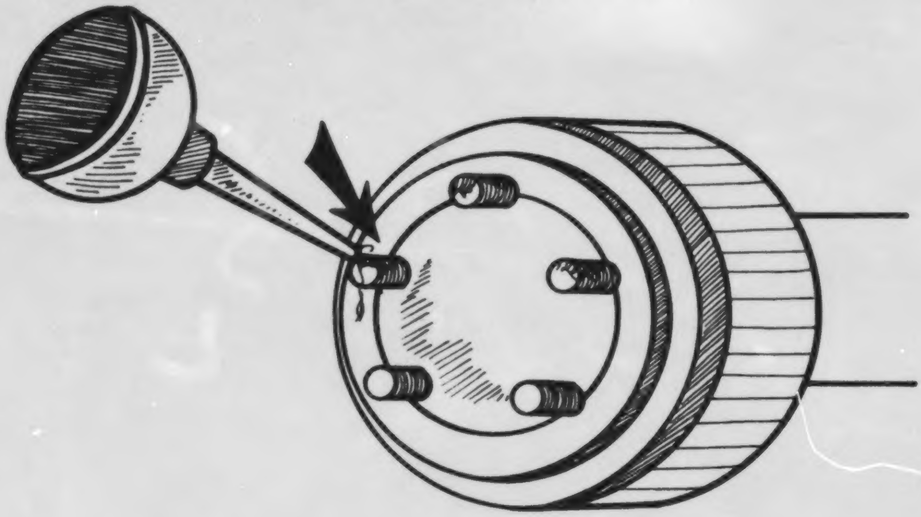
14. Inflate tire and gage to correct air pressure.



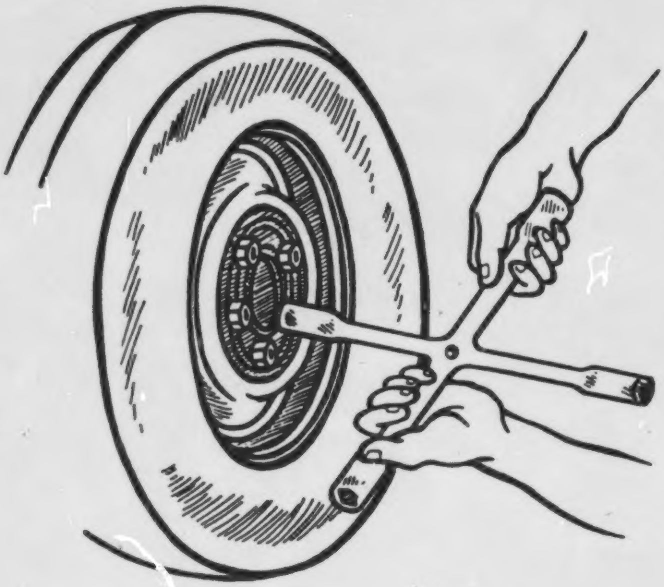
15. Apply soap solution around plug and check for leaks.

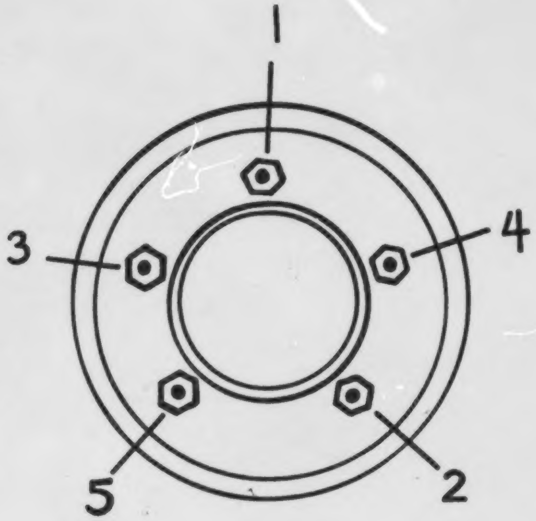


16. Apply engine oil to the studs of the hub.



17. Remount tire on studs. Tighten nuts in correct order.





18. Clean your work area and return tools to their proper places.

SEE YOUR INSTRUCTOR

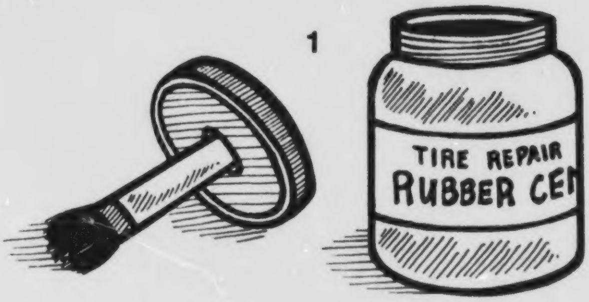
Unit 18
Repairing a Tubeless Tire - Plugging Method

Tools and Materials Identification Exercise

Match each word with correct object provided.

_____A. Plug Needle
_____B. Valve Core Remover
_____C. Rubber Cement
_____D. Soap Solution

1



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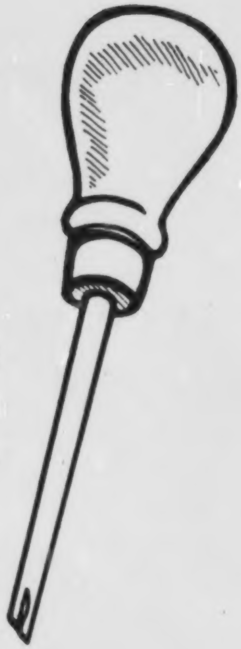

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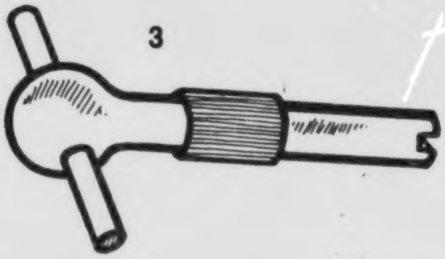

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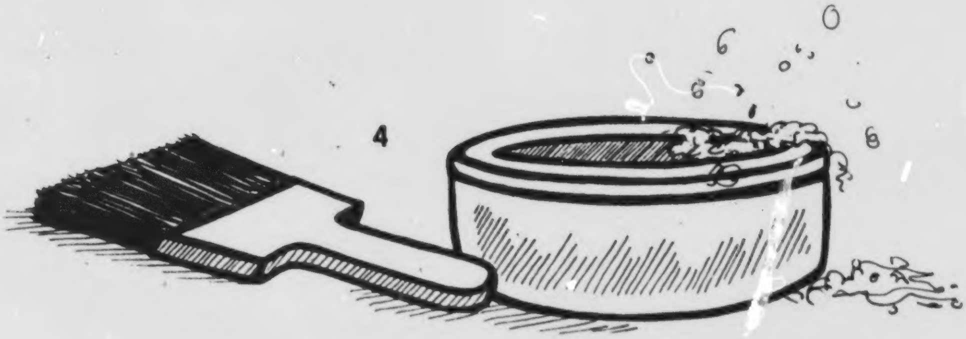


Unit 18
Repairing a Tubeless Tire - Plugging Method

Practical Exercise Performance Checklist

The student ______________________ successfully performed the following tasks:

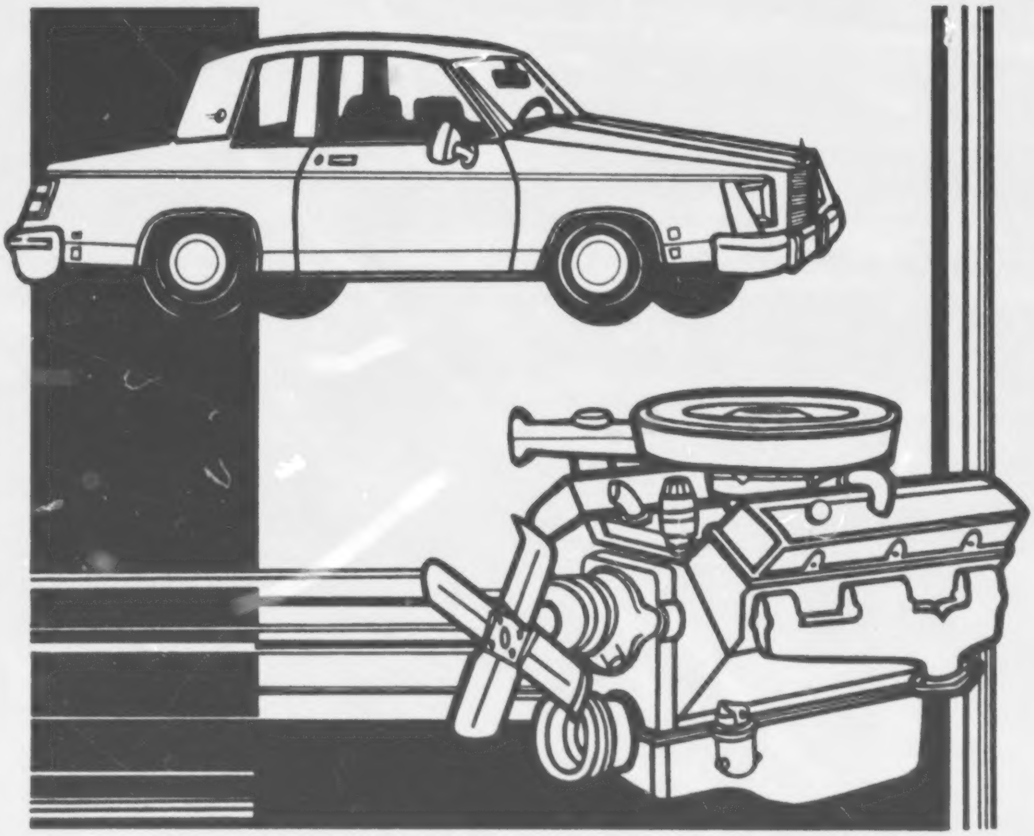
Tasks	Yes	No	Comments
1. Identified:			
a. Plug needle			
b. Valve core remover			
c. Rubber cement			
d. Soap solution			
2. Wore proper safety equipment.			
3. Correctly removed flat tire from car.			
4. Inflated the tire.			
5. Applied soap solution to tire and located puncture.			
6. Marked punctured spot.			
7. Removed punctured object from tire.			
8. Lubricated puncture with rubber cement.			
9. Inserted rubber plug into plug needle.			
10. Passed rubber plug and needle through puncture.			
11. Pulled out needle from puncture.			
12. Cut excess plug leaving about 1/8" above tire tread.			
13. Inserted valve core back into valve stem and tightened with valve core remover.			
14. Inflated tire and gaged tire pressure.			

Tasks	Yes	No	Comments
15. Applied soap solution around plug and checked for leaks.			
16. Lubricated the studs of hubs with engine oil.			
17. Correctly remounted tire assembly on the studs.			
18. Cleaned work area and returned tools to their proper places.			

Satisfactory Performance ☐
Repeat Exercies ☐
Should Move On ☐

Instructor's Signature ________________ Date ________

Vocational Preparation Curriculum
AUTO SERVICE



Unit 19

Repairing a Tubeless Tire - Patching Method

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL TECHNICAL
EDUCATION

IML

INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

Unit 19
Repairing a Tubeless Tire - Patching Method

Repairing a Tubeless Tire - Patching Method

After you study this lesson, you should be able to:

1. Identify tools, materials and equipment used in patching a tubeless tire.
2. Patch a tubeless tire.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ I can do all the tasks above and want my instructor to give me the Practical Exercise.

SEE YOUR INSTRUCTOR

2. ☐ I want to study the information in this unit before I do the Practical Exercise.

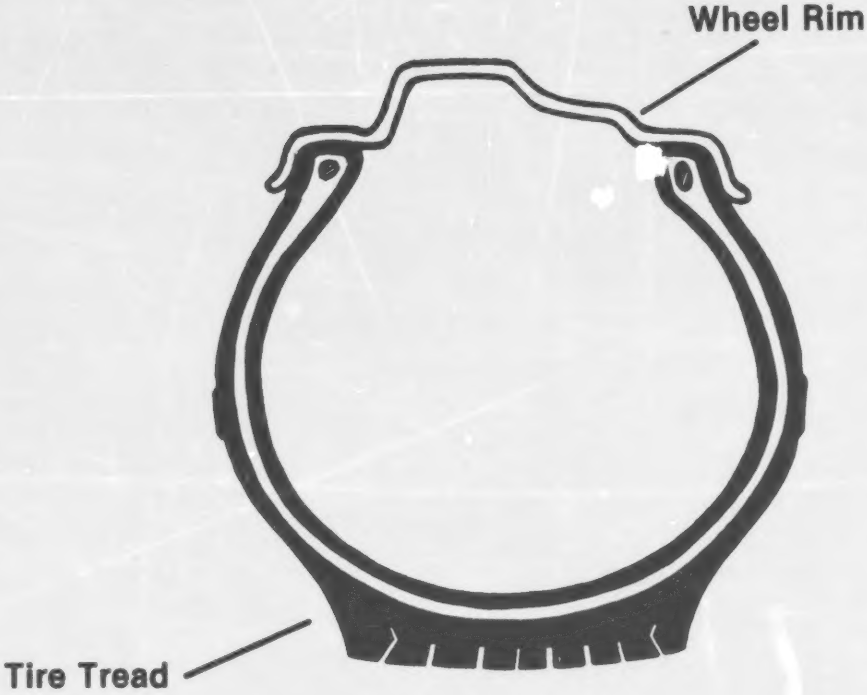
TURN THE PAGE AND BEGIN

Unit 19
Repairing a Tubeless Tire - Patching Method

Introduction

Sometimes a flat tire must be removed from the wheel and patched on the inside. This usually has to be done if the puncture is somewhat large or if the object which punctured the tire is completely inside the tire.

This unit will show you the proper way to remove the tire from the wheel and patch the hole.



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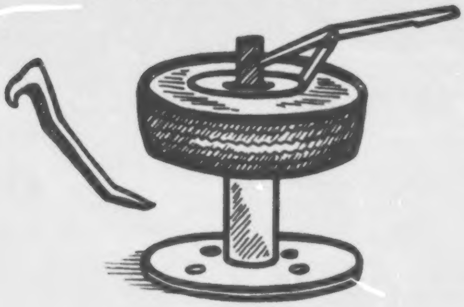
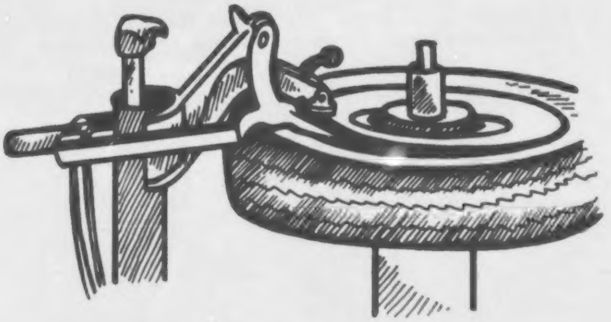
Unit 19
Repairing a Tubeless Tire - Patching Method

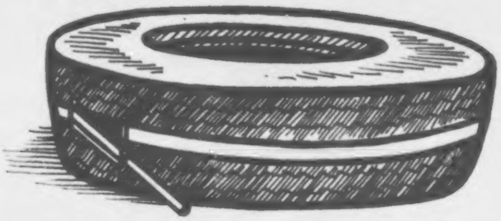
A. Tools, Materials and Equipment for Repairing a Tubeless Tire - Patching Method.

1. **TIRE CHANGING EQUIPMENT:** Device used to apply pressure in a break bead seal between tire and wheel. There are many types of bead breakers and tire changers.

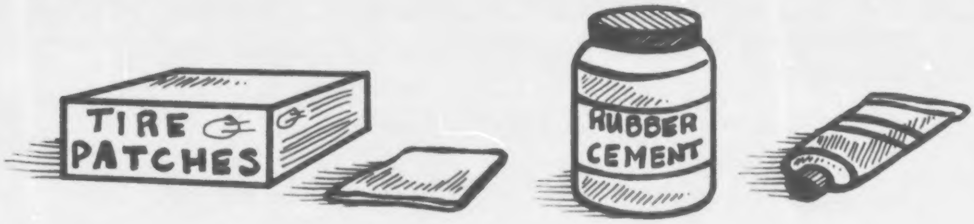




2. **MOUNTING BAND:** Used to force tire beads against wheel rim to permit tire inflation.



3. **TIRE PATCHING KIT:** Material used to patch or seal a puncture or tire hole.



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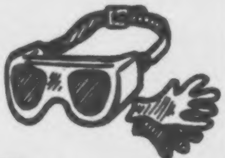
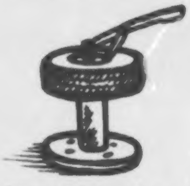
B. Steps for Repairing a Tubeless Tire - Patching Method.

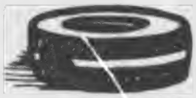
1. Find and Check Off the following:



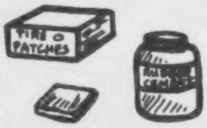
☐ Safety Equipment



☐ Tire Changing Equipment

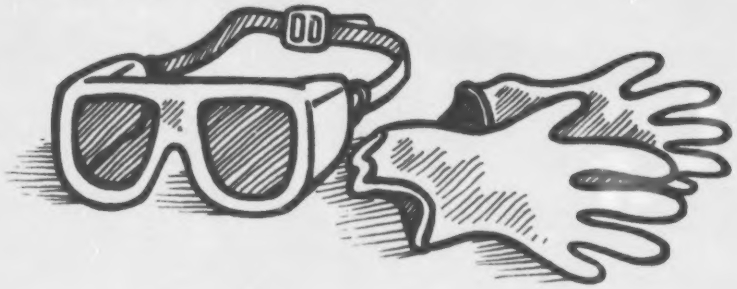


☐ Mounting Band

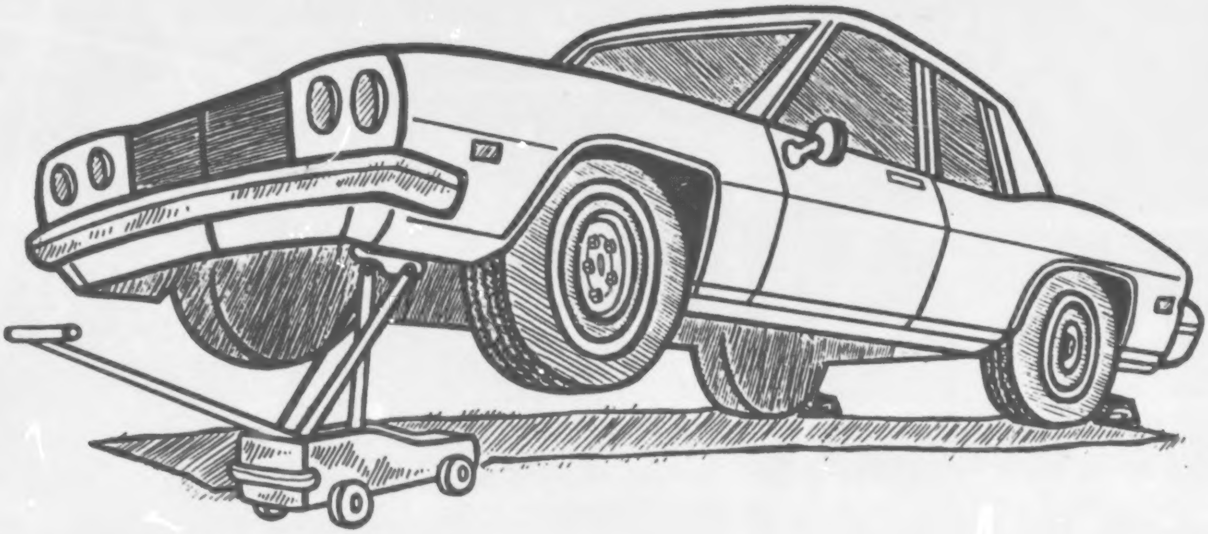


☐ Tire Patch Kit

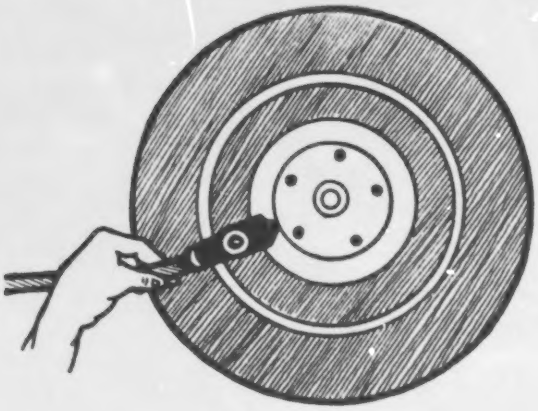
2. Wear proper safety equipment.

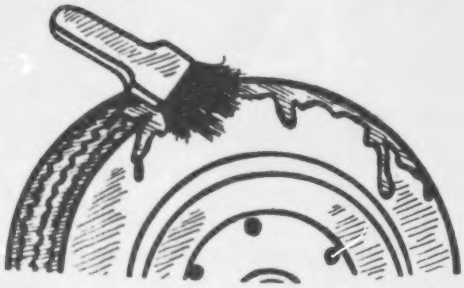


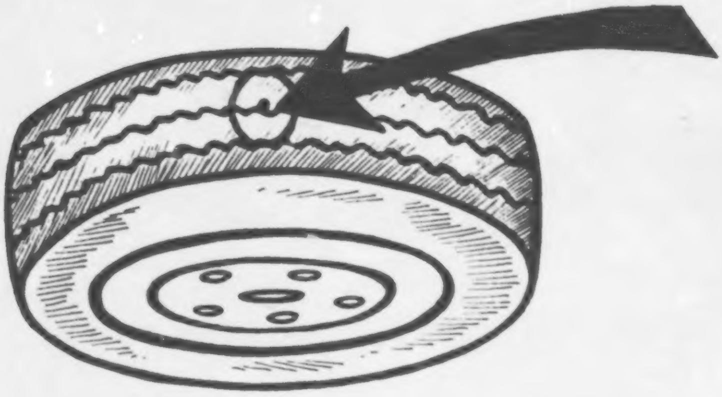
3. Raise car safely and remove flat tire.



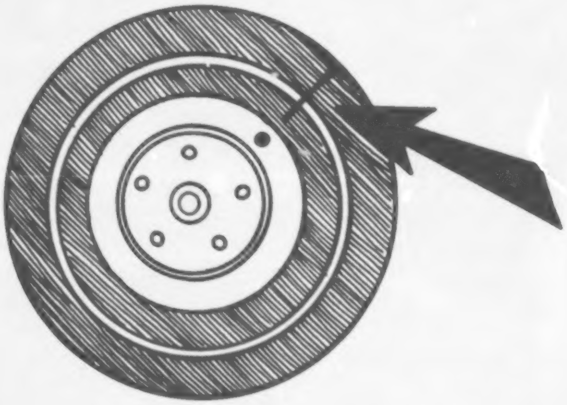
4. Inflate tire and locate puncture using soap solution. Mark punctured spot.



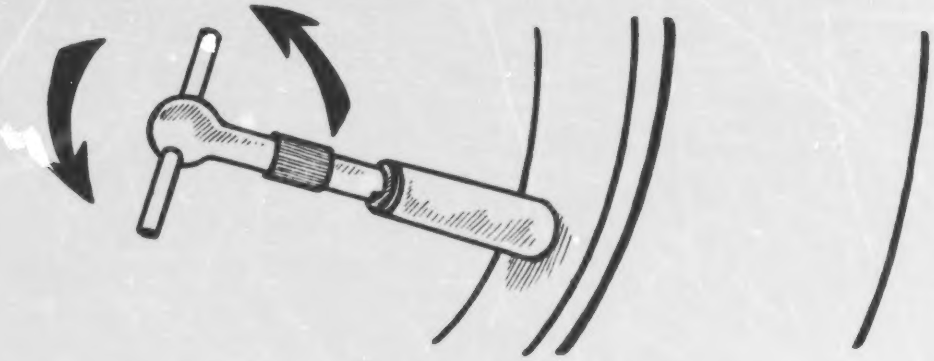




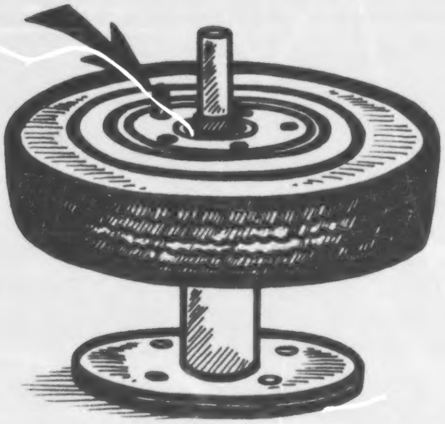
5. Mark a spot on the tire in line with valve stem location.



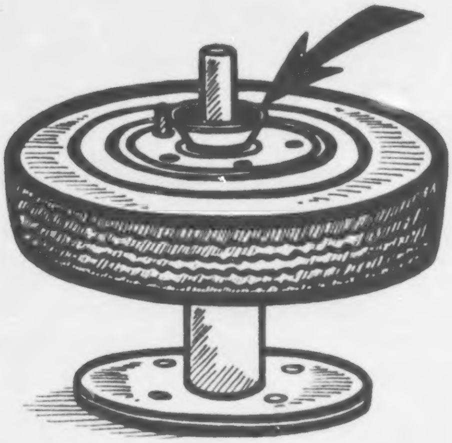
6. Remove valve core from valve stem.



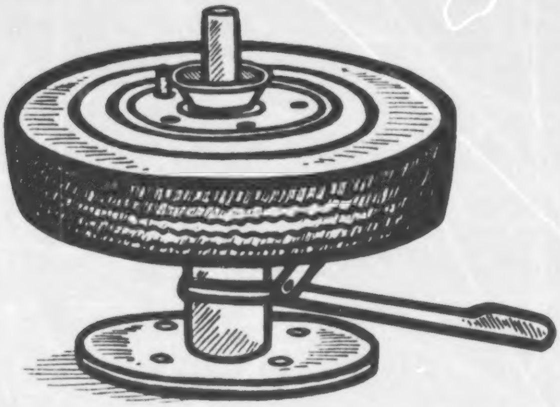
7. Place wheel and tire on tire changer with the positioning pin through one lug bolt hole in wheel pin.



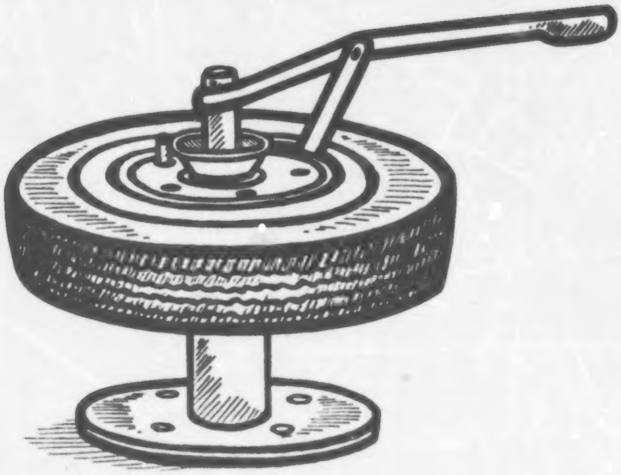
8. Lock wheel in place with hold down cone.



9. Loosen bottom bead with hand tools supplied with machine.



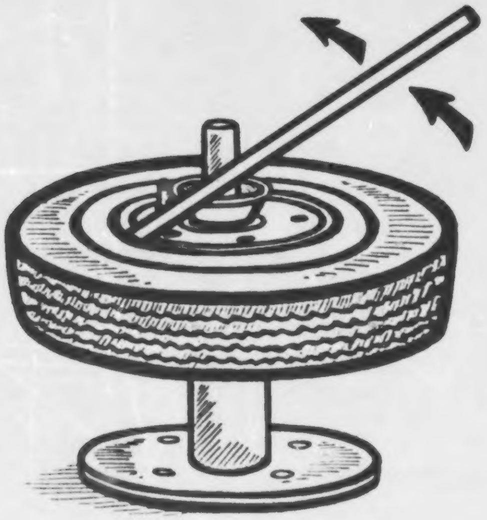
10. Loosen top bead with hand tool.



NOTE!

Place tool on tire away from the valve or the valve may be damaged.

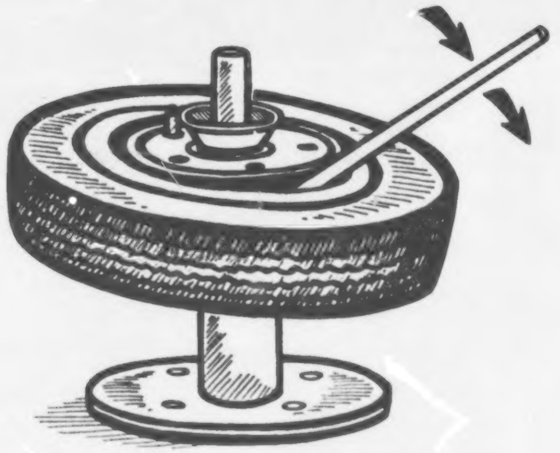
11. Remove top bead of tire with a long bar tool supplied with tire changer.



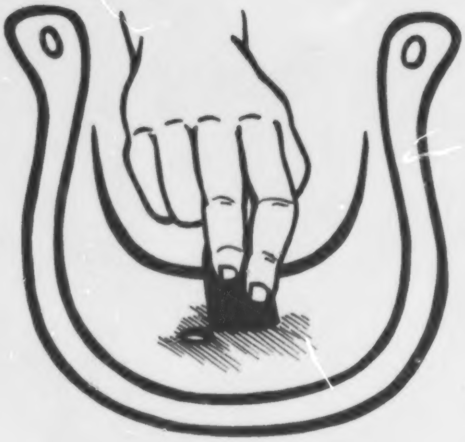
NOTE!

Always apply lubricant to both top and bottom beads.

12. Remove bottom bead, use the same tool.



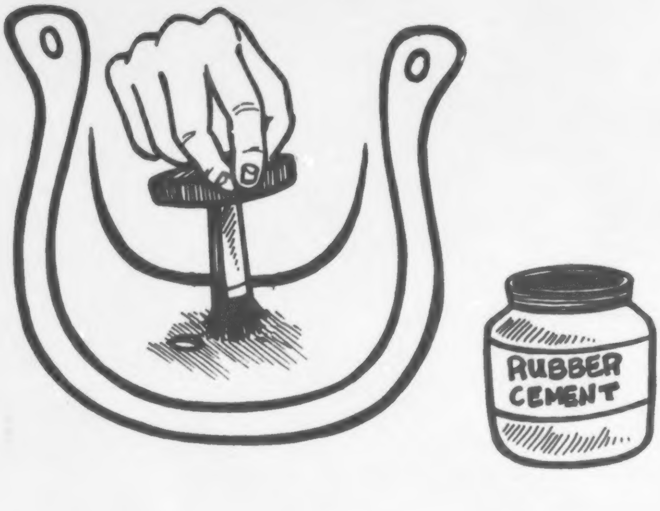
13. Find inside puncture. Clean punctured area and roughen the surface with a buffer.



CAUTION!

Wear safety glasses when buffing tire.

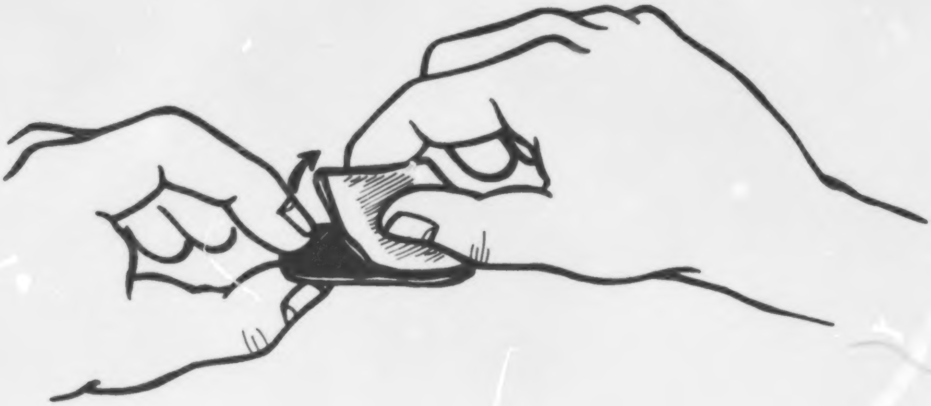
14. Apply rubber cement to roughened surface. Allow it to dry.



NOTE!

Be careful not to touch the cemented area otherwise the patch will not stick as well.

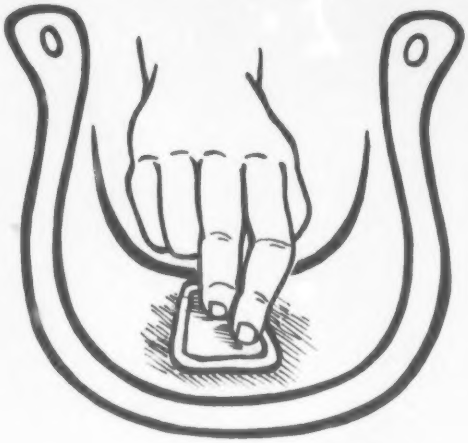
15. Obtain a rubber patch large enough to cover puncture. Remove protective coating from patch.



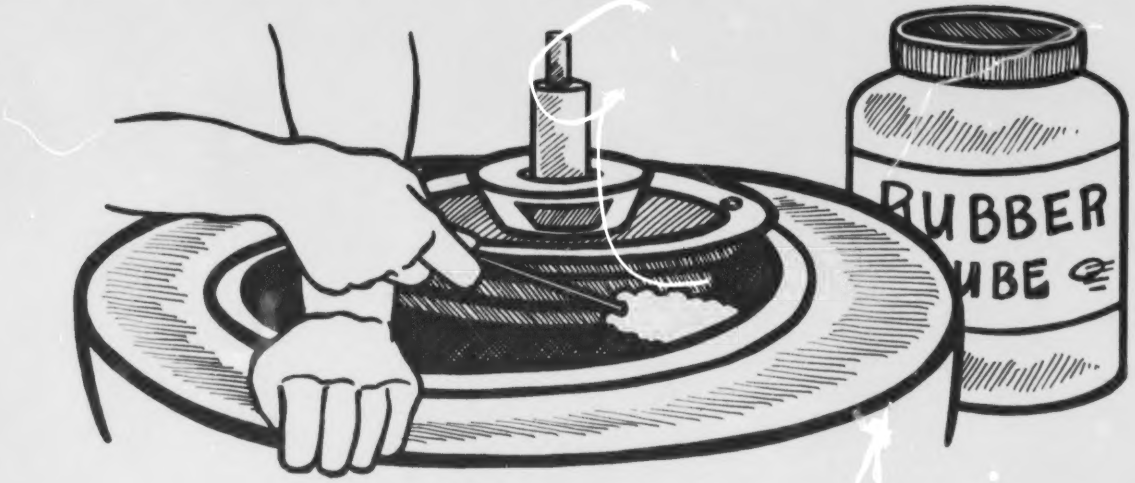
NOTE!

Be careful not to touch the sticky exposed surface of patch. Oil or dirt on your fingers may prevent the patch from sticking properly.

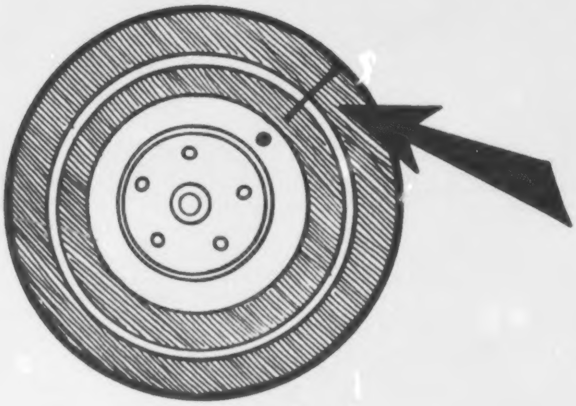
16. Apply patch to puncture in the tire. Press patch firmly until it sticks evenly. Burnish entire patch to insure a firm seal.



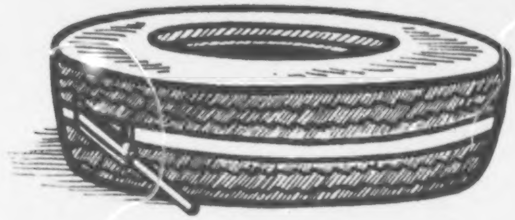
17. Apply rubber lube around tire beads.



18. Remount tire on wheel. Align the mark you made on tire with valve.

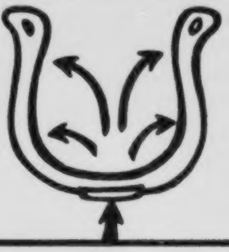


19. Attach the tire mounting band around center of tire.

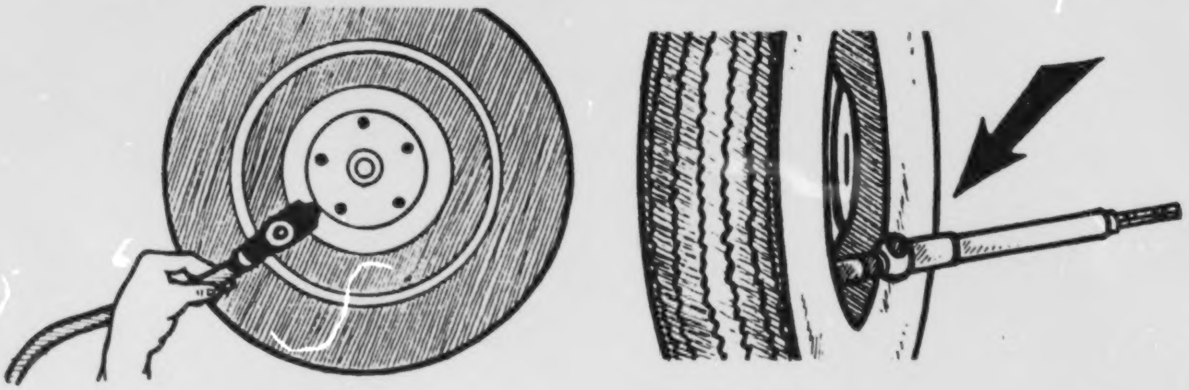


NOTE!

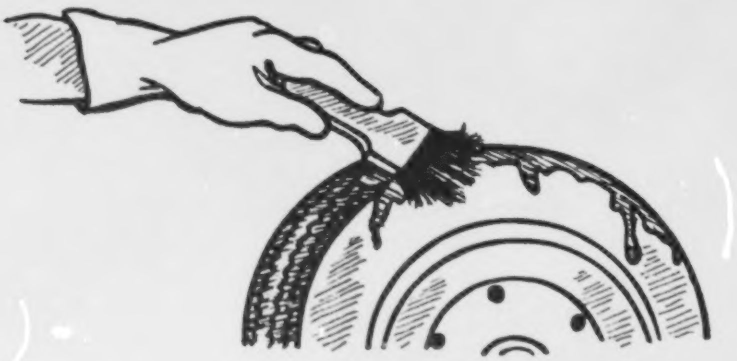
Tire mounting band expands beads and allows for easier inflation of tubeless tire.



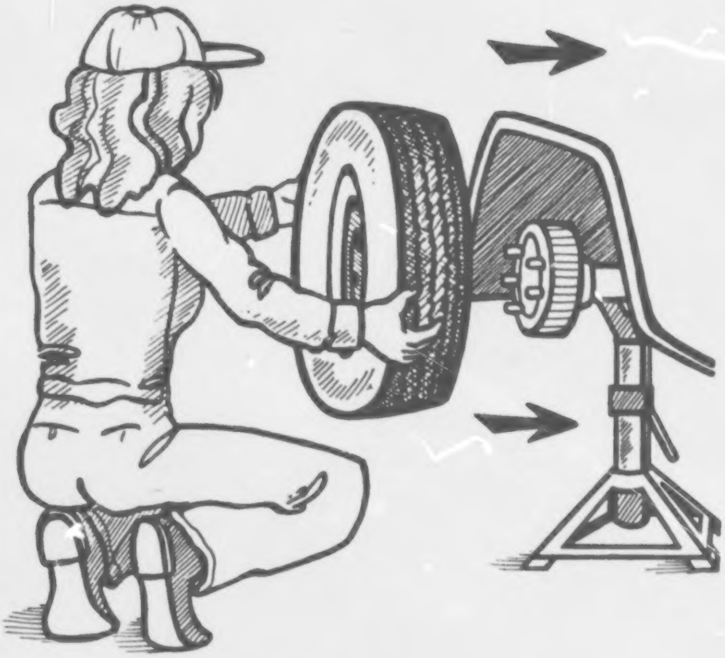
20. Inflate tire and check for correct pressure with gage.



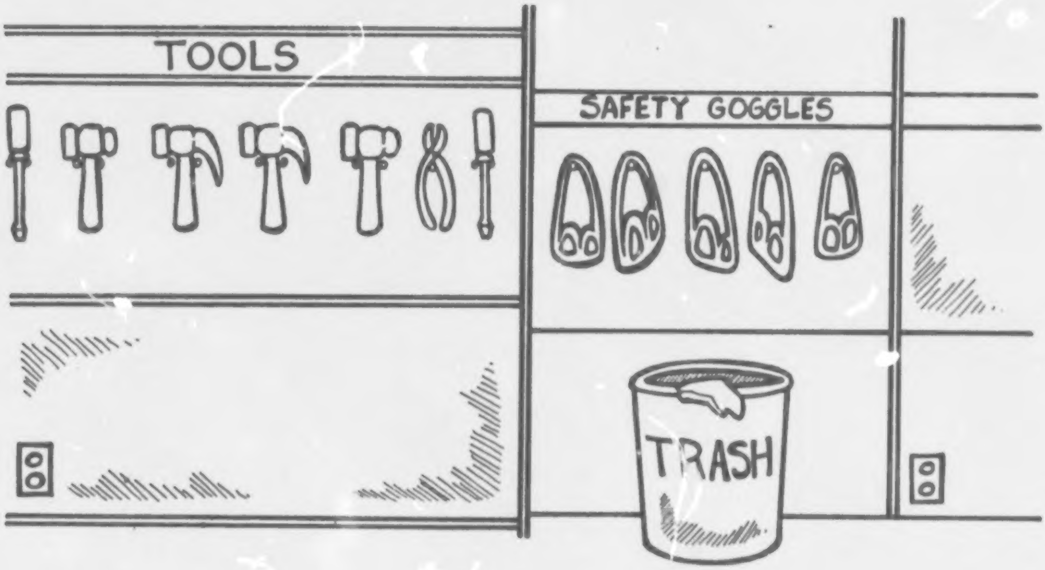
21. Apply soap solution again to the tire and check for leaks.



22. Mount repaired tire on vehicle.



23. Return tools to the proper places.


TOOLS
SAFETY GOGGLES
TRASH

SEE YOUR INSTRUCTOR

Unit 19
Repairing a Tubeless Tire - Patching Method

Tools and Materials Identification Exercise

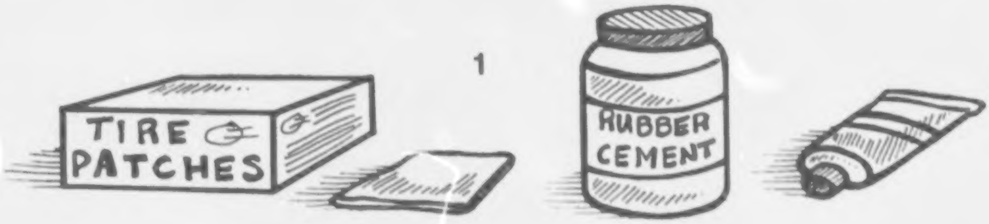
Match the words with the correct object provided below.

_____A. Tire Changing Equipment

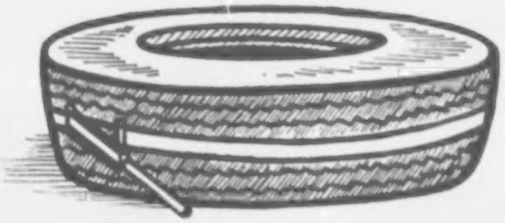
_____B. Mounting Band

_____C. Tire Patching Kit

1


TIRE PATCHES
RUBBER CEMENT

2



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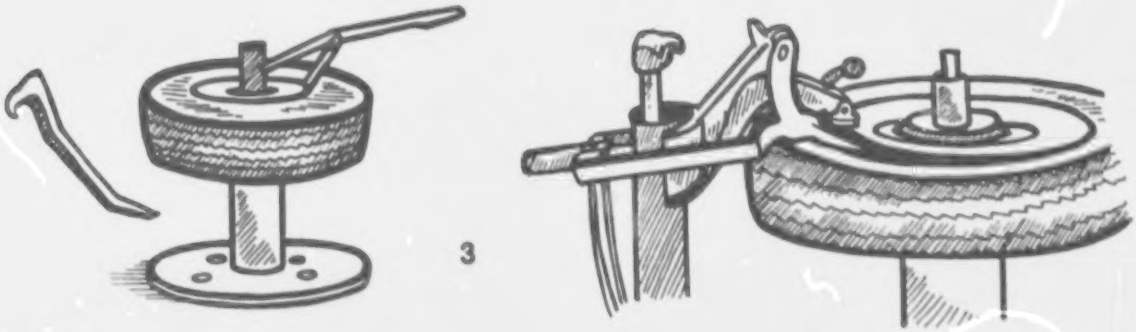

Unit 19

Repairing a Tubeless Tire - Patching Method

Practical Exercise Performance Checklist

The student ____________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified:			
a. Tire changing equipment			
b. Tire patch kit			
c. Mounting band			
2. Wore proper safety equipment.			
3. Safely raised car and removed flat tire.			
4. Inflated tire to specifications and located puncture by applying soap solution.			
5. Marked the punctured spot.			
6. Marked a spot on the tire in line with valve stem.			
7. Deflated tire by removing valve core from valve stem.			
8. Placed wheel and tire on tire changer.			
9. Locked wheel in place with hold down cone.			
10. Loosened bottom bead with hand tool.			
11. Loosened top bead with hand tool.			
12. Removed top bead of tire with a long bar tool.			
13. Removed bottom bead with same tool.			
14. Cleaned puncture and roughened the surface around it.			

Tasks	Yes	No	Comments
15. Applied rubber cement on roughened surface and allowed it to dry.			
16. Removed protective coating from tire patch.			
17. Properly patched the puncture.			
18. Applied rubber cement around new valve and pulled assembly through hole in wheel rim.			
19. Mounted tire on wheel.			
20. Aligned mark on tire with valve stem.			
21. Inflated tire and gaged tire pressure to specifications.			
22. Applied soap solution on tire to check leakages.			
23. Properly mounted the tire onto the car.			
24. Cleaned work area and returned tools to their proper places.			

Satisfactory Performance ☐
Repeat Exercise ☐
Should Move On ☐

Instructor's Signature ____________ Date ________

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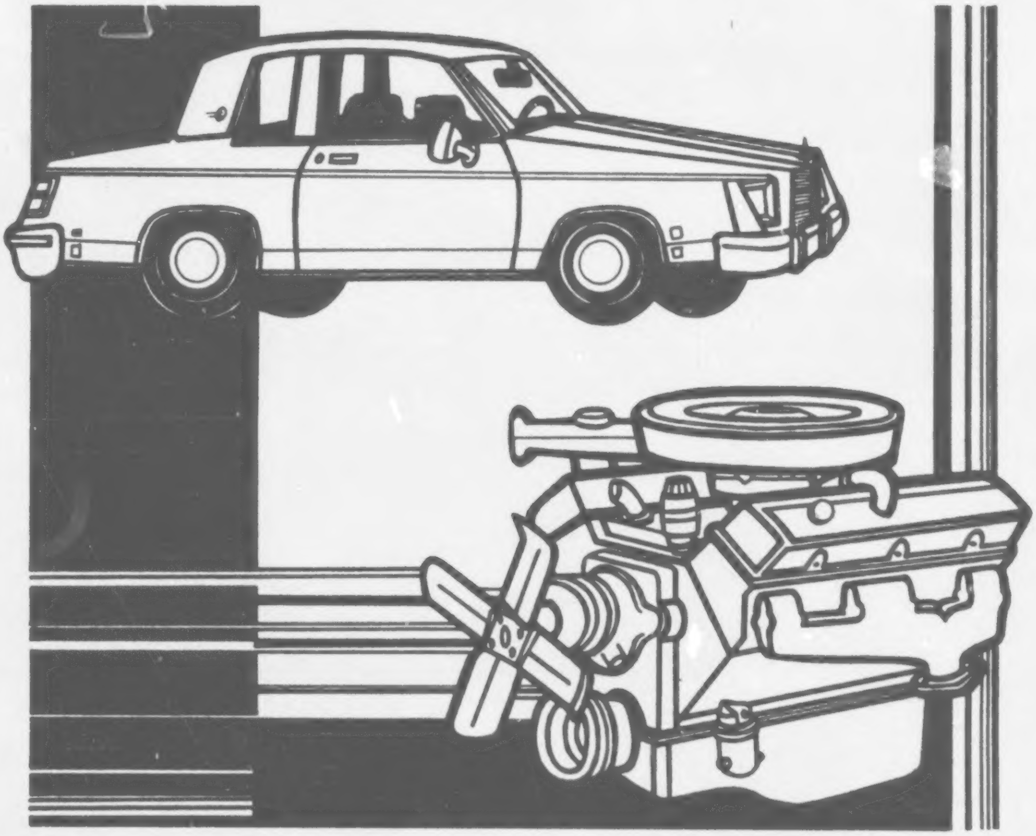
Vocational Preparation Curriculum
AUTO SERVICE



Unit 20

Balancing Tires

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION
iml
INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

Unit 20
Balancing Tires

Balancing Tires

After you study this lesson, you should be able to:

1. Identify tools, materials and equipment used to balance tires.
2. Select proper wheel weights for tire balancing.
3. Balance a car tire.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

SEE YOUR INSTRUCTOR

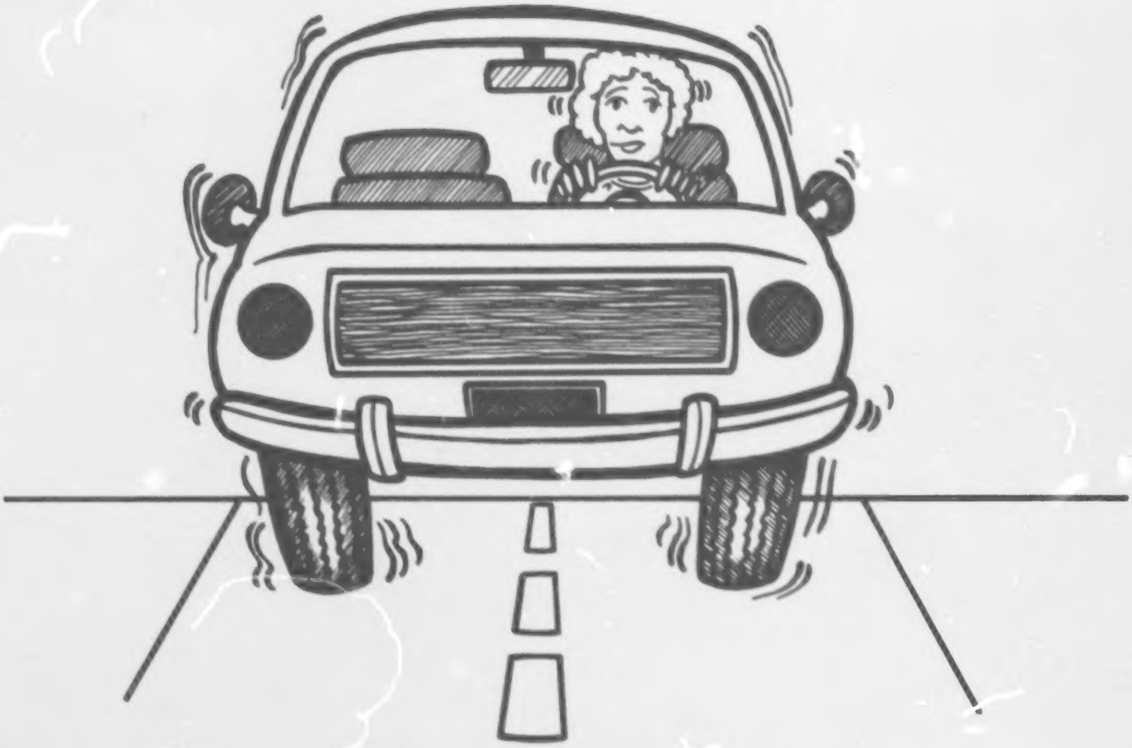
2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

TURN THE PAGE AND BEGIN

Unit 20
Balancing Tires

Introduction

Unbalanced car tires cause problems for cars. When cars are unbalanced, their weight is uneven on the road. As a result, unbalanced tires wear unevenly. This causes bald or smooth spots on the tires. Unbalanced tires also vibrate when the car is moving. Balancing tires is necessary to increase their life and make a smooth ride. Balancing car tires is important for an auto service worker.



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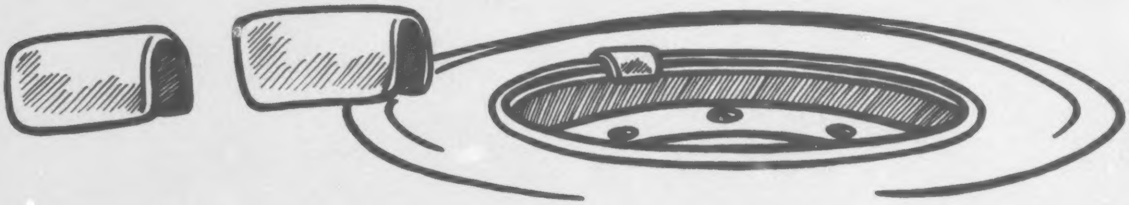
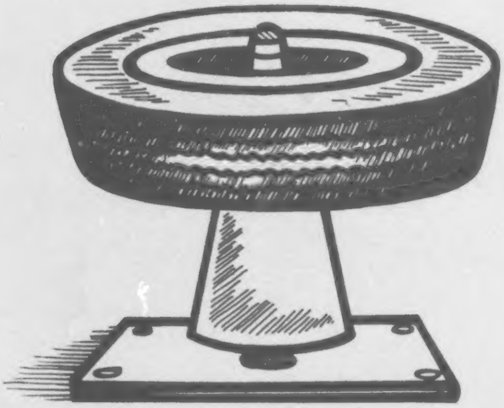
Unit 20
Balancing Tires

A. Tools, Materials and Equipment for Balancing Tires.

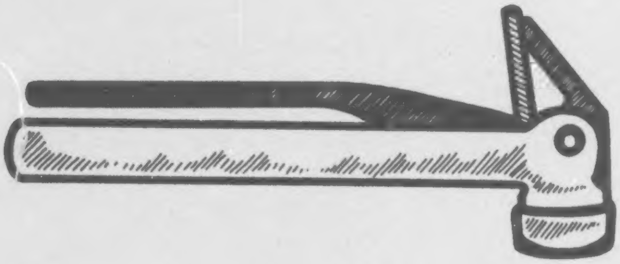
1. **WHEEL WEIGHT:** Piece of metal attached to a wheel in order to balance tire.



2. **BUBBLE BALANCER:** Used to balance car tires.



3. **WEIGHT HAMMER:** Small hammer used to attach weights to a wheel.



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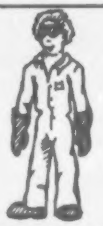
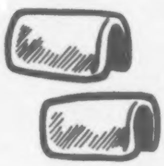
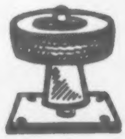
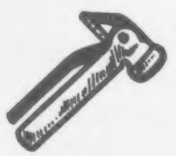
B. Steps for Balancing Tires

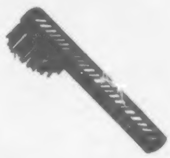
1. Find and Check Off the following:

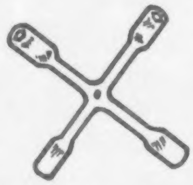

☐ **Safety Equip.**

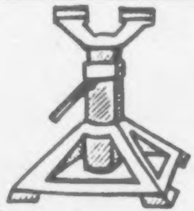

☐ **Wheel Weight**

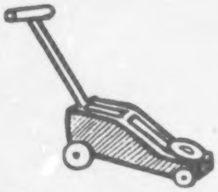

☐ **Bubble Balancer**


☐ **Weight Hammer**

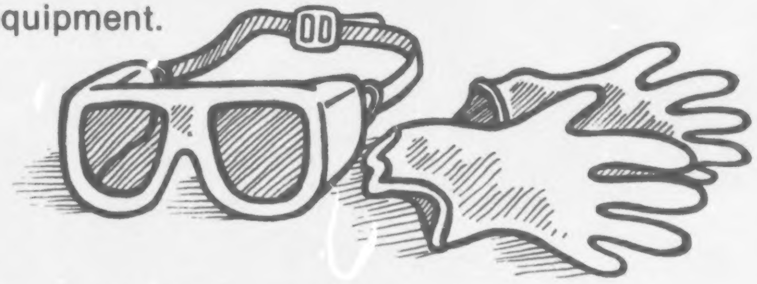

☐ **Wire Brush**


☐ **Lug Wrench**

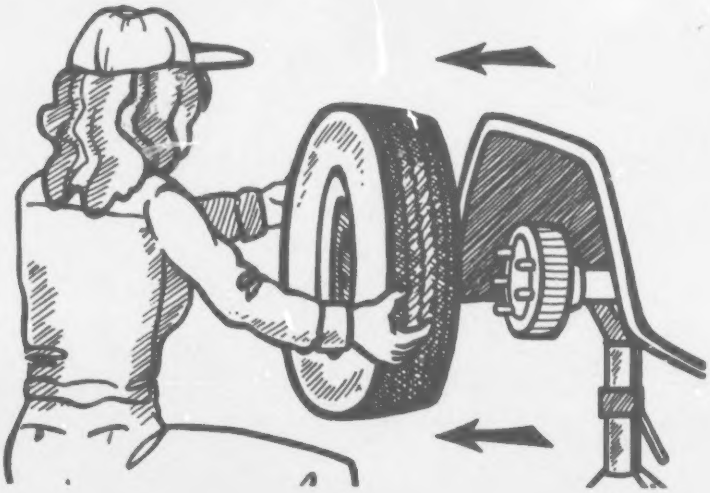

☐ **Jack Stand**


☐ **Jack**

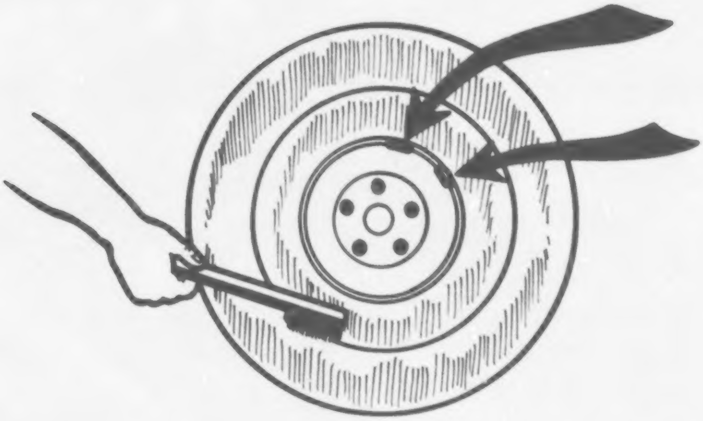
2. Wear proper safety equipment.



3. Remove tire to be balanced from automobile.



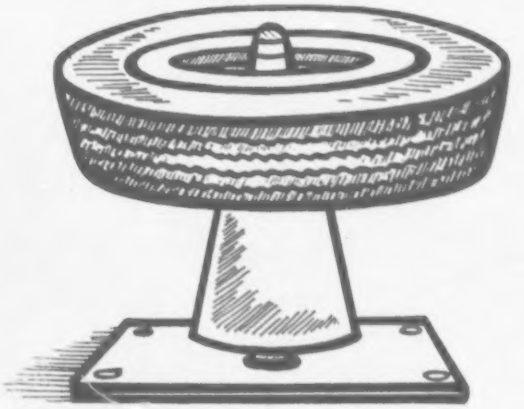
4. Clean wheel and remove old weights from wheel rim.



NOTE!

Always clean wheels before balancing it to get a true balance.

5. Place cleaned wheel and tire on bubble balancer.



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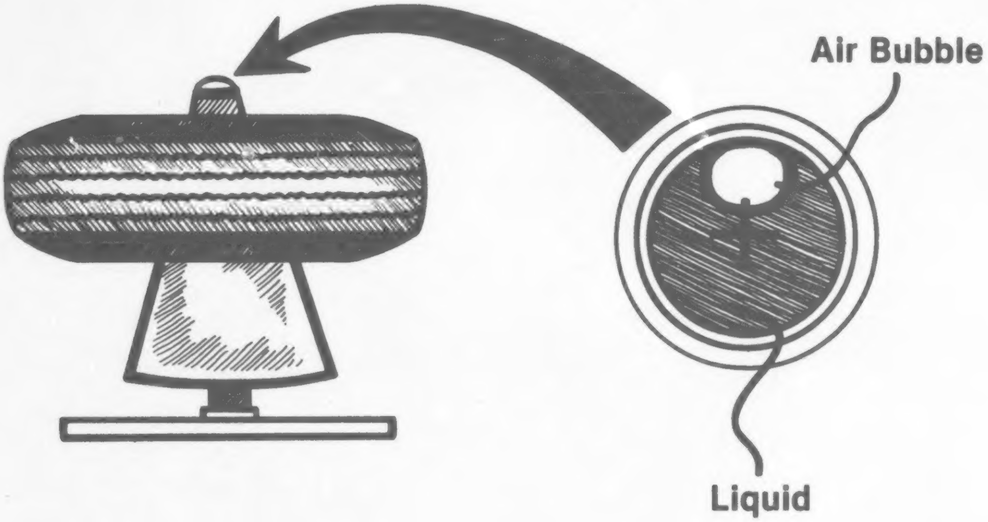
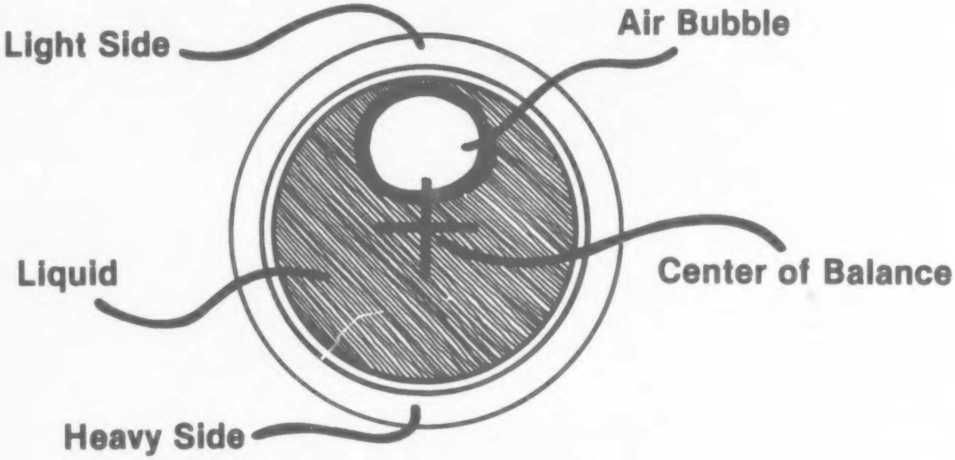
6. Observe the position of bubble in the glass on top of the balancer.


Air Bubble
Liquid

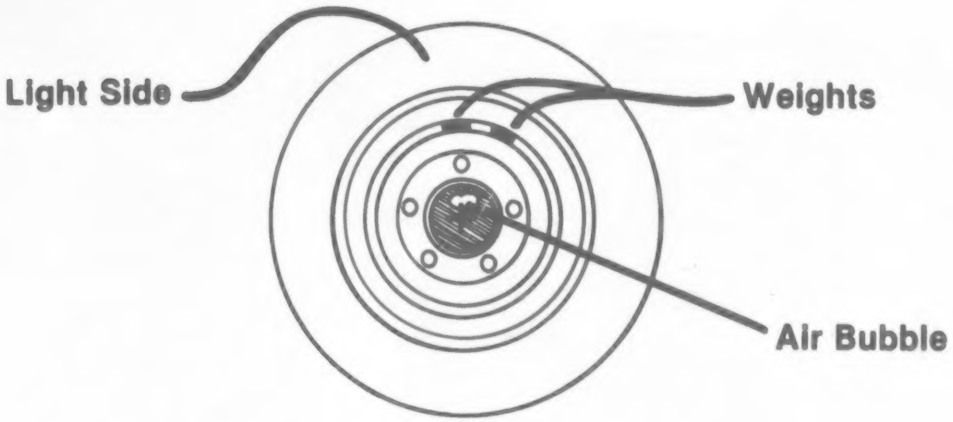
NOTE!

If the bubble is centered on the x or exactly in the middle of glass, tire is balanced.


Light Side
Air Bubble
Liquid
Center of Balance
Heavy Side

If bubble is not centered, tire is not balanced. The side of wheel opposite the bubble is the heaver side.

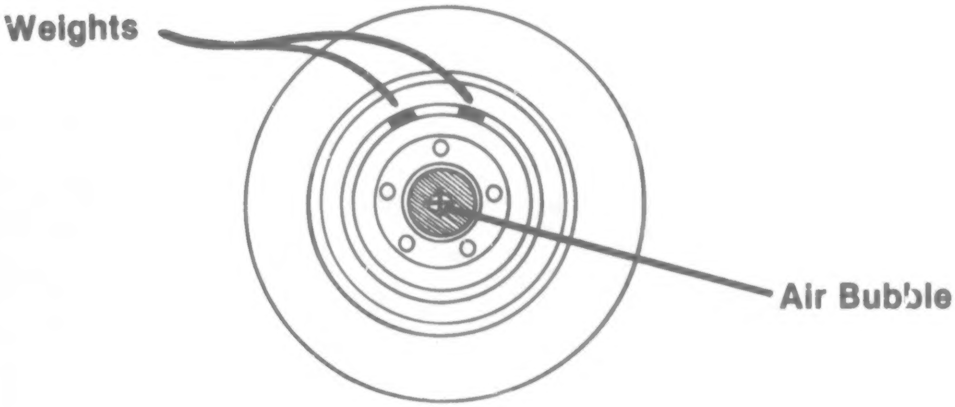
7. Start adding weights to lighter side of tire to balance it.


Light Side
Weights
Air Bubble

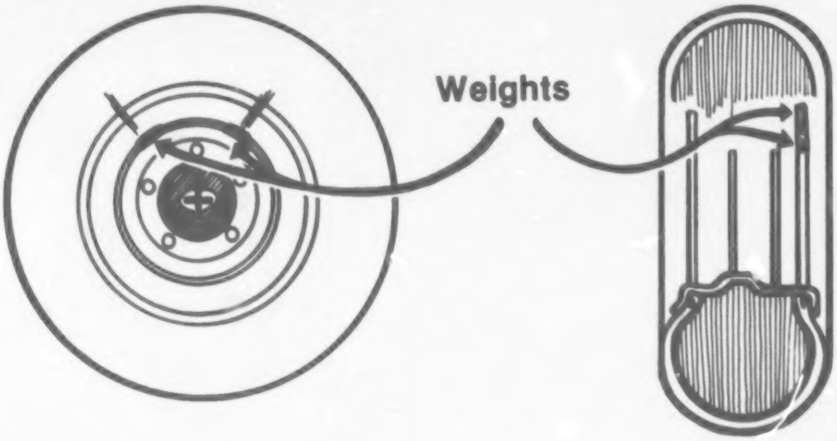
NOTE!

If the weight needed is more than one ounce, divide the weights into four equal portions.

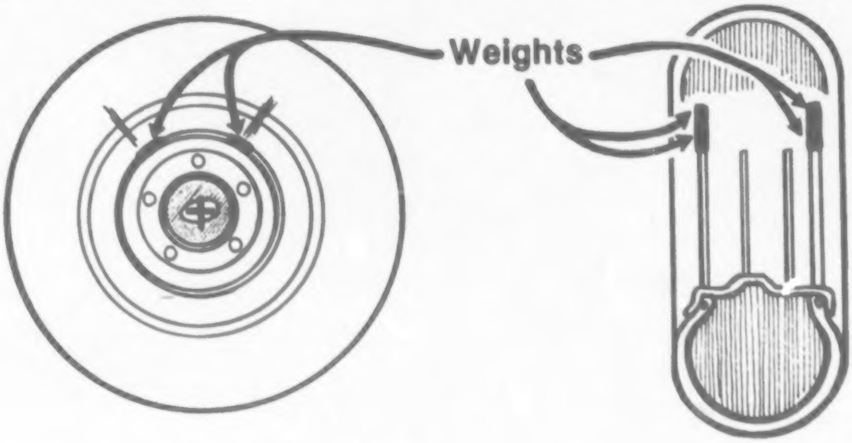
8. Place weights on wheel and move them until bubble occupies the center of glass.


Weights
Air Bubble

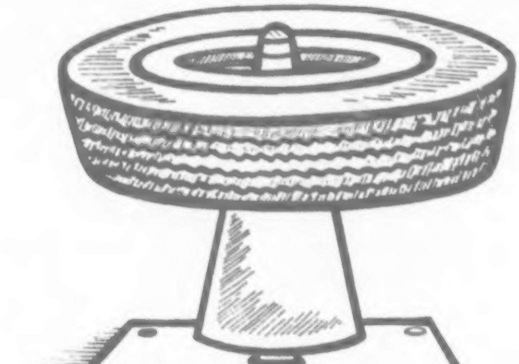
9. Mark these positions with chalk. Attach two parts of the weight to the outer wheel rim.



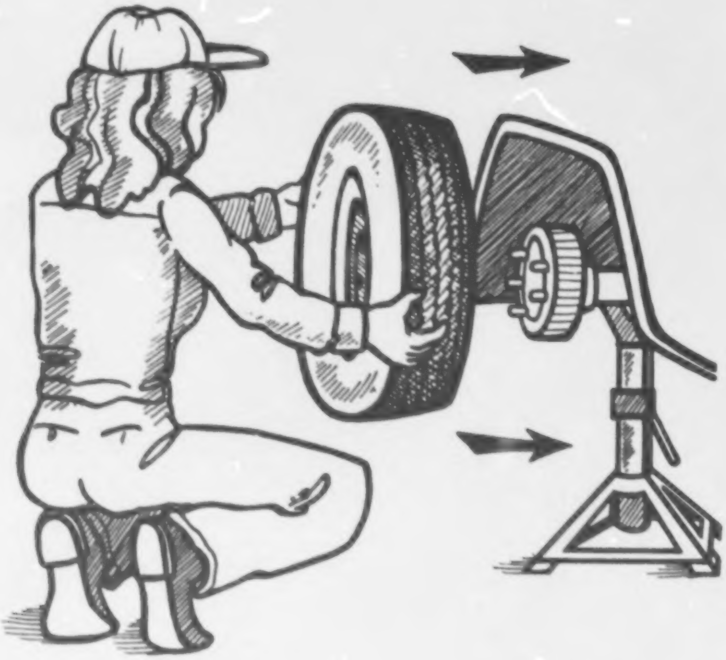
10. Turn tire over. Attach remaining two weights to inner wheel in positions exactly opposite to these on the outer wheel.



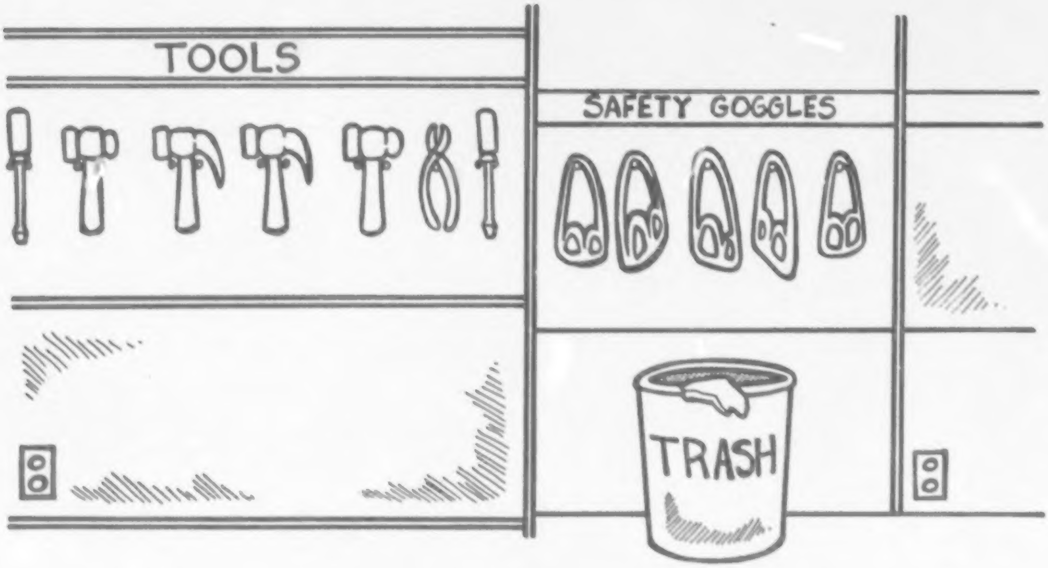
11. Check tire balance on machine.



12. Remount tire on vehicle.



13. Clean work area and return tools to their proper places.


TOOLS
SAFETY GOGGLES
TRASH

SEE YOUR INSTRUCTOR

Unit 20
Balancing Tires

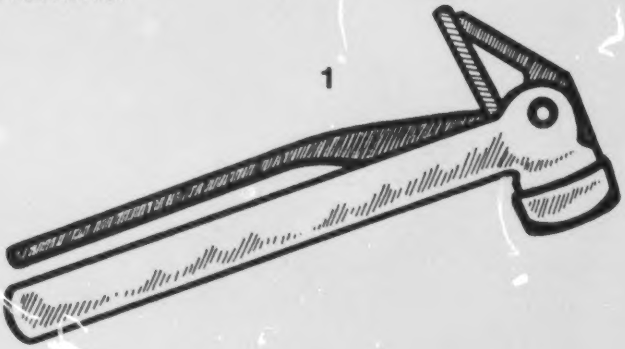
Tools and Materials Identification Exercise.

Match the word with the correct object provided below.

____A. Wheel Weight

____B. Bubble Balancer

____C. Weight Hammer



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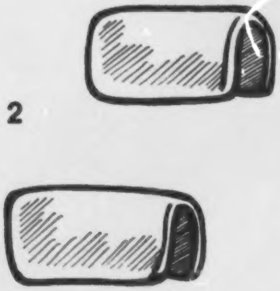
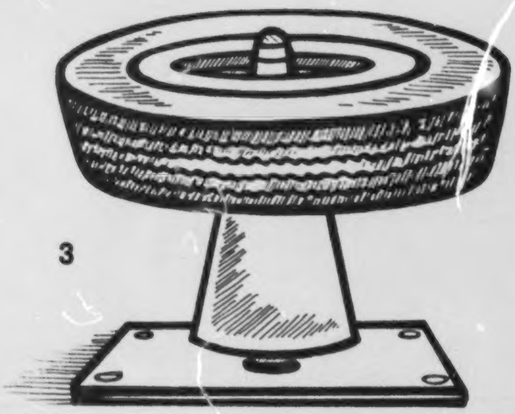


2



3

Unit 20
Balancing Tires

Practical Exercise Performance Checklist

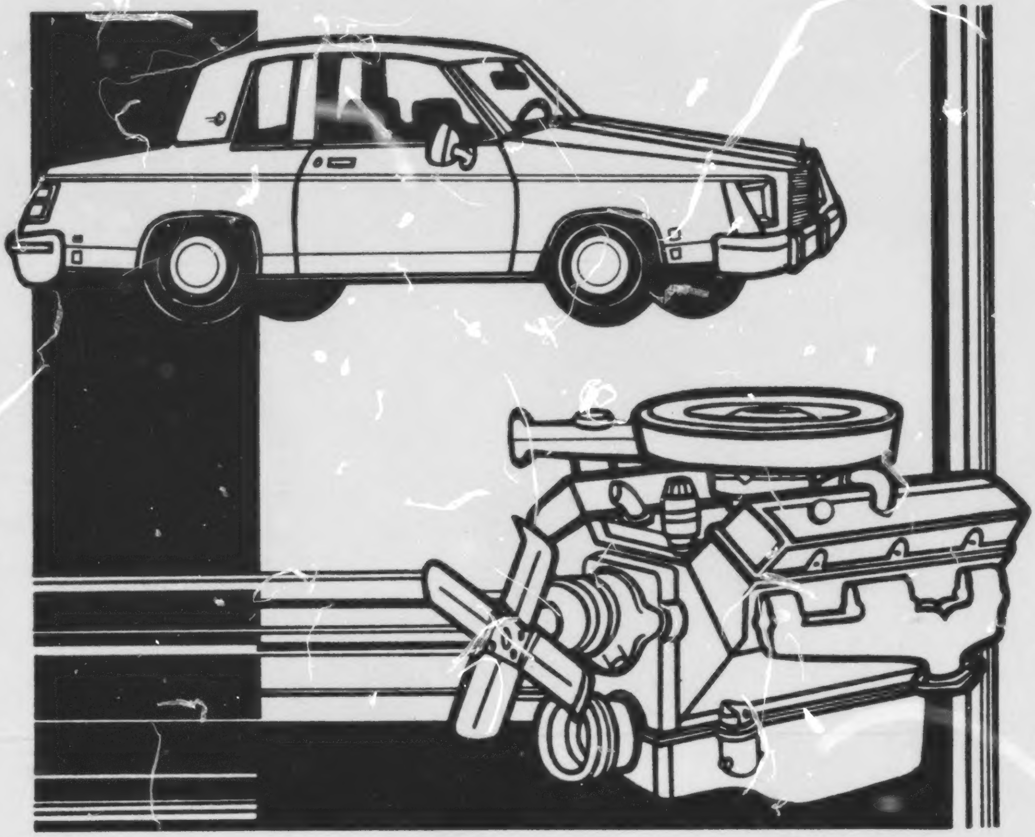
The student ______________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified:			
a. Wheel weight			
b. Bubble balancer			
c. Weight hammer			
d. Jack			
e. Jack stand			
f. Lug wrench			
g. Wire brush			
2. Wore proper safety equipment.			
3. Removed tire to be balanced from car.			
4. Cleaned wheel rim and removed old weights from wheel.			
5. Placed clean wheel on bubble balancer.			
6. Observed position of bubble.			
7. Added weights to lighter side of car to balance it.			
8. Moved weight around wheel until bubble occupied center of glass.			
9. Marked positions with chalk and attached two parts of weight to outer wheel.			
10. Turned tire over and attached remaining two weights to inner wheel.			
11. Checked tire balance on machine.			
12. Remounted tire on car.			
13. Cleaned work area and returned tools to their proper places.			

Satisfactory Performance ☐
Repeat Exercise ☐
Should Move On ☐

______________________________ Instructor's Signature
______________ Date

Vocational Preparation Curriculum
AUTO SERVICE



Unit 21

Repacking Front Wheel Bearings

Developed by: Hogan Usoro

PRACTICAL ARTS
AND
VOCATIONAL-TECHNICAL
EDUCATION

iml

INSTRUCTIONAL MATERIALS LABORATORY
UNIVERSITY OF MISSOURI-COLUMBIA

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Unit 21

Repacking Front Wheel Bearings

Repacking Front Wheel Bearings

After you study this lesson, you should be able to:

1. Identify tools, materials and equipment used to repack front wheel bearings.
2. Repack front wheel bearings.

Show What You Can Do.

Check the statement that fits you best.

1. ☐ **I can do all the tasks above and want my instructor to give me the Practical Exercise.**

   SEE YOUR INSTRUCTOR

2. ☐ **I want to study the information in this unit before I do the Practical Exercise.**

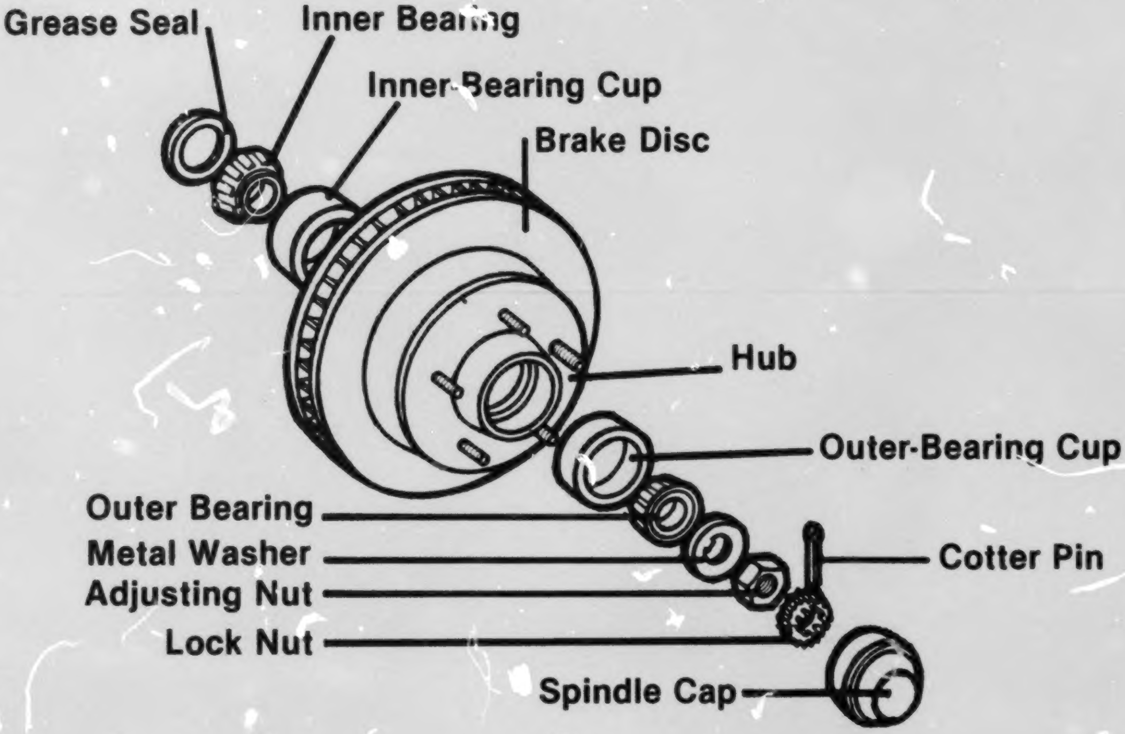
   TURN THE PAGE AND BEGIN

Unit 21
Repacking Front Wheel Bearings

Introduction

The wheel assembly of a car is mounted on small steel balls or cones called bearings. Bearings enable wheels to turn easily and smoothly. Grease in bearing gradually wears out. When this happens, bearings must be removed and repacked.

Repacking wheel bearings is a very important function of auto service workers.

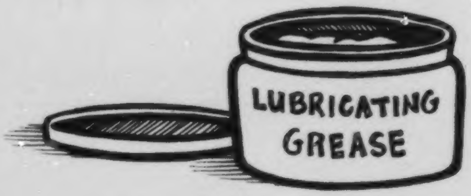

Grease Seal
Inner Bearing
Inner-Bearing Cup
Brake Disc
Hub
Outer-Bearing Cup
Outer Bearing
Metal Washer
Adjusting Nut
Lock Nut
Cotter Pin
Spindle Cap

TURN TO NEXT PAGE

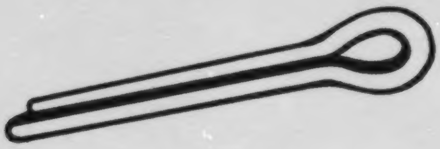
Unit 21
Repacking Front Wheel Bearings

A. **Tools, Materials and Equipment for Repacking Front Wheel Bearings.**

1. **WHEEL BEARING GREASE:** Lubricant used to repack wheel bearings.

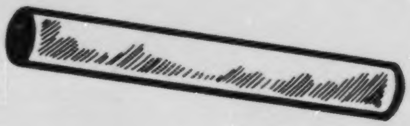


2. **COTTER PIN:** Used to hold wheel bearing assembly on the spindle.



3. **WHEEL BEARINGS SETS:** Roller bearings used to replace worn wheel bearings.

4. **PUNCH:** Used to tap bearings and grease seals out of wheel assembly.



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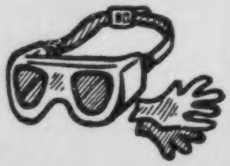
B. Steps for Repacking Front Wheel Bearings.

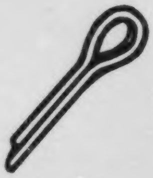
1. Find and Check Off the following.


LUBRICATING

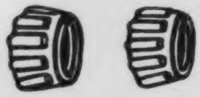
☐ Safety Equipment

LUBRICATING
GREASE

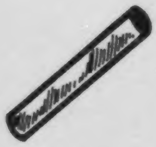
☐ Wheel Bearing Grease



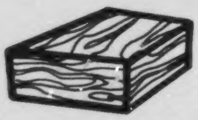
☐ Cotter Pin



☐ Wheel Bearings



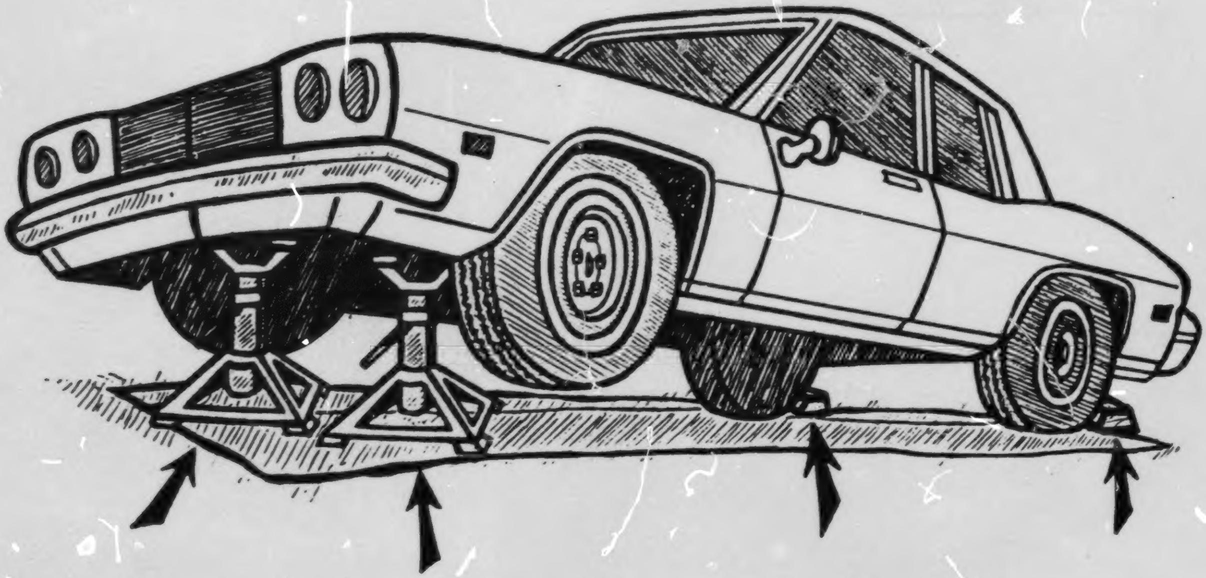
☐ Punch



☐ Wooden Block

2. Wear proper safety equipment.

3. Raise front of car and support on jack stands. Use wedge block on back tires.



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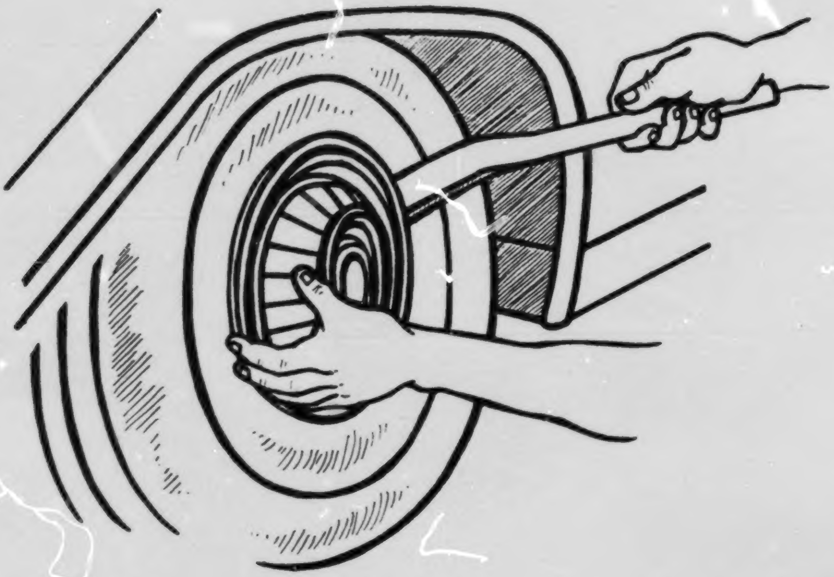
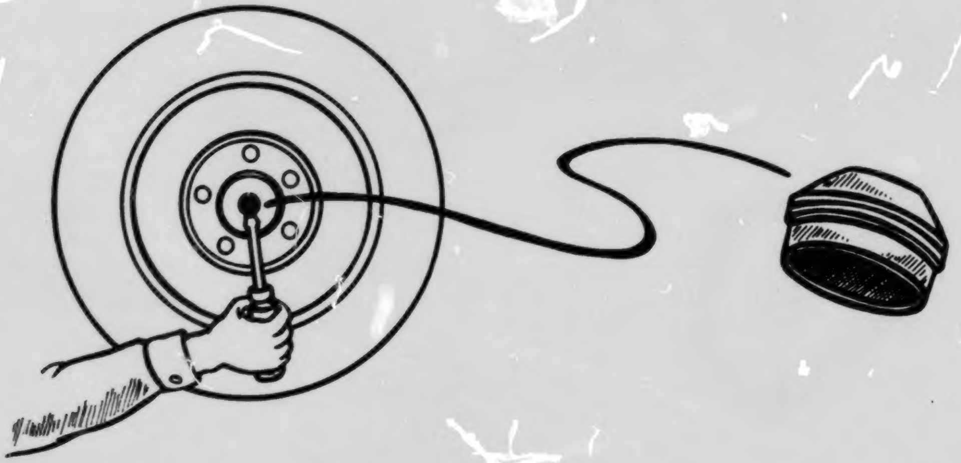
4. Remove wheel cover from wheel.

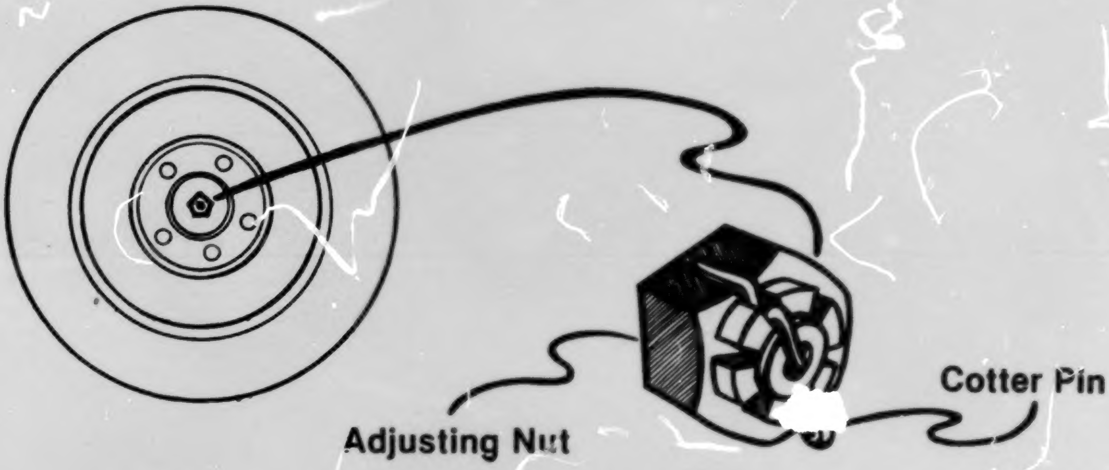


5. Remove grease cap from center of wheel.

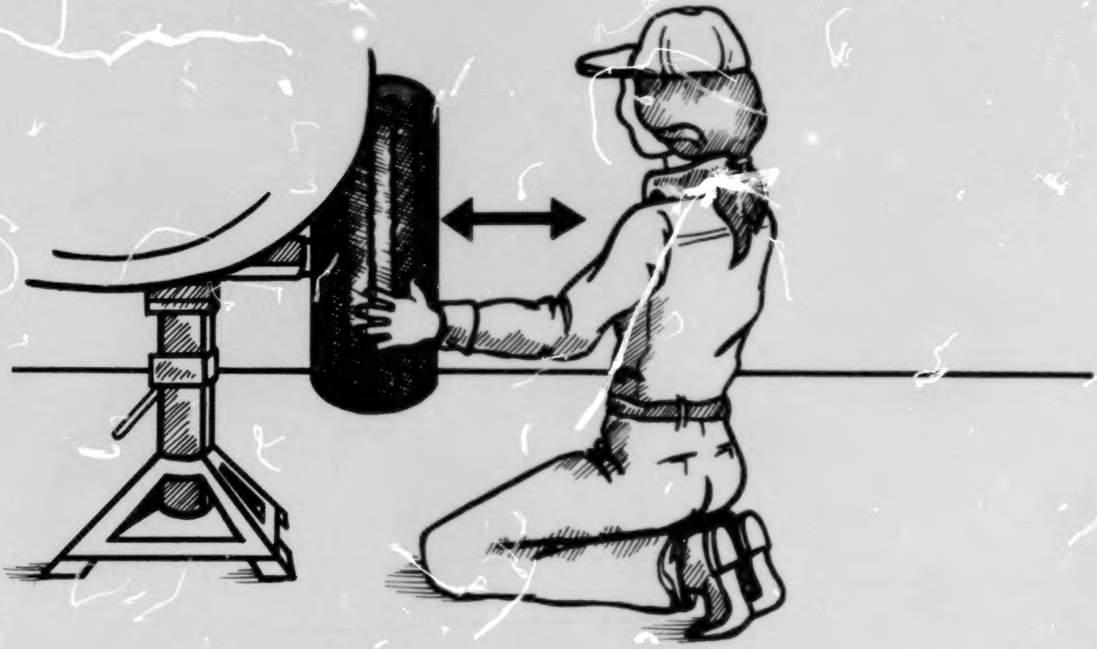


Grease cap will pop off when you pry it outward.

6. Straighten and remove cotter pin and remove adjusting nut.


Cotter Pin
Adjusting Nut

7. Pull entire wheel and tire out about one inch, then push it back into place. This exposes outer wheel bearing.



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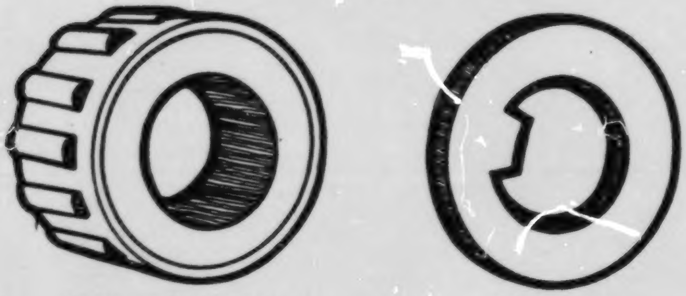
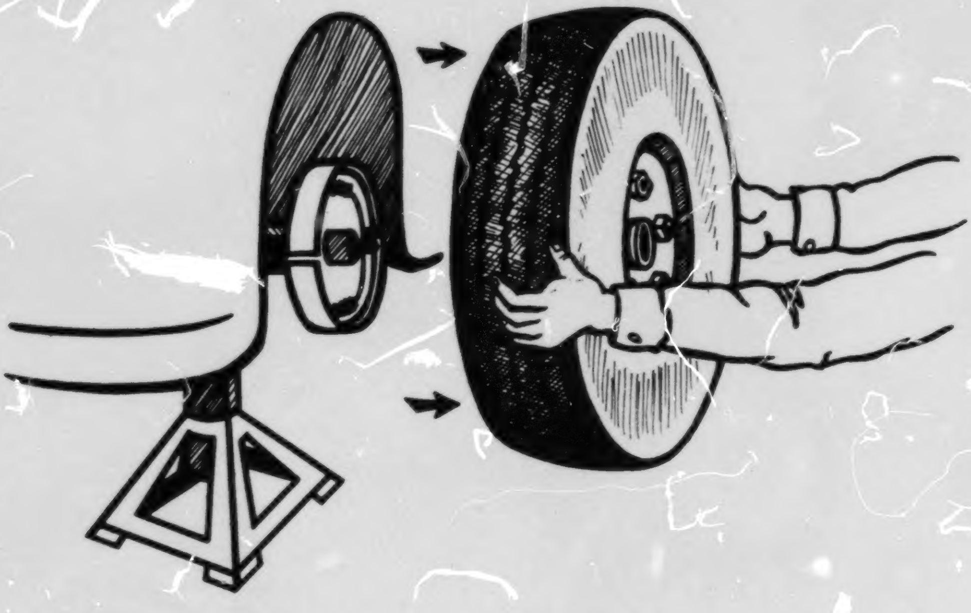
8. Remove the outer bearing assembly and washer. Wipe them clean with a cloth or shop towel.

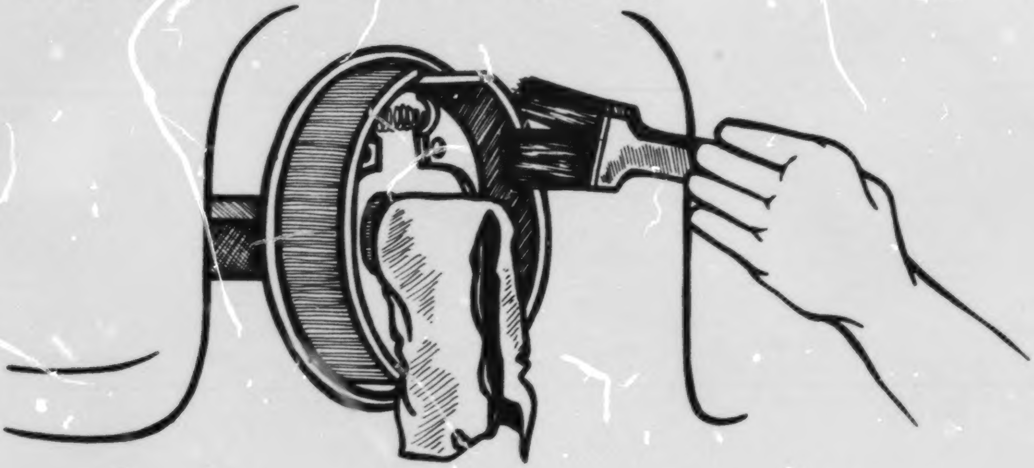


Outer Bearing **Washer**

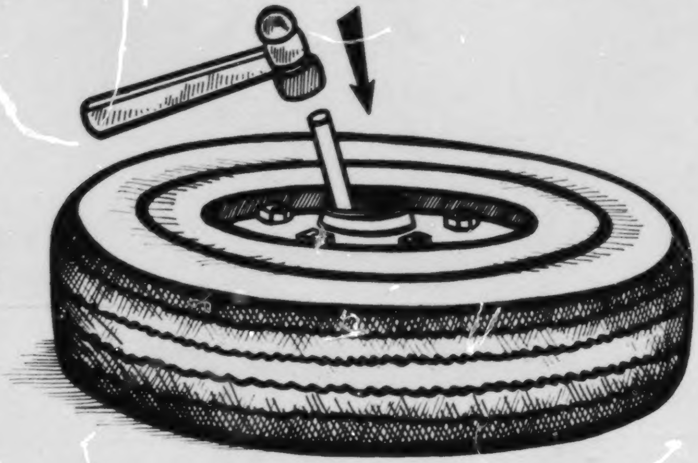
9. Carefully remove wheel tire assembly and lay it on the ground.



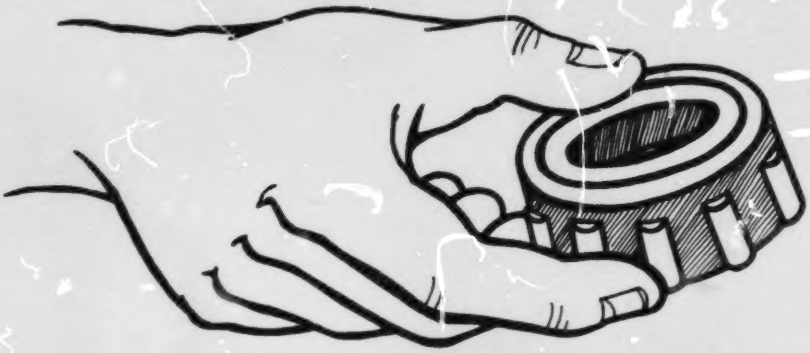
10. Cover spindle and clean brake assembly.



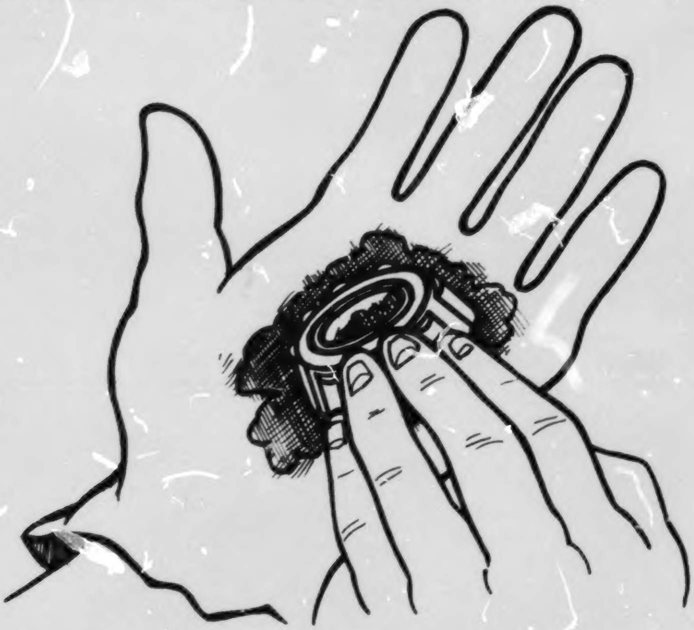
11. Tap inner bearing and grease retainer out of wheel. Turn over wheel.



12. Clean and inspect each bearing for cracks and wear. Replace them if they are not good.



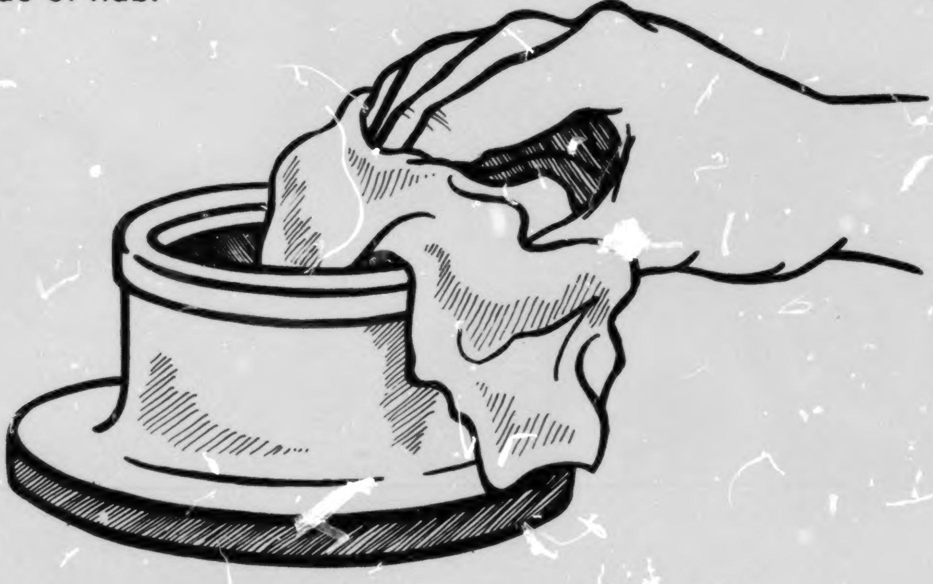
13. Repack wheel bearings with grease. Set bearings aside.



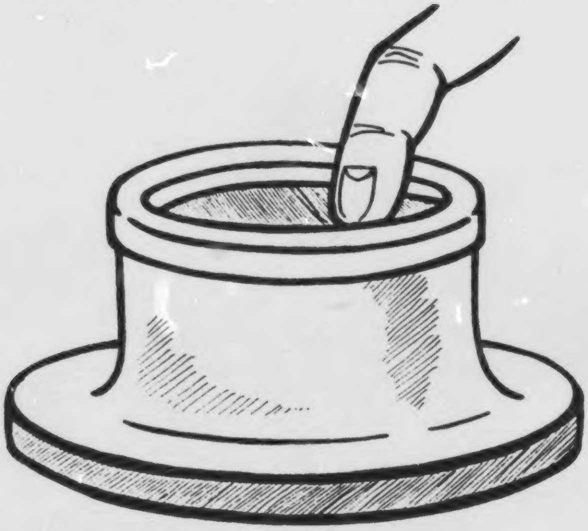
NOTE!

Be sure grease gets in spaces between each roller. This is done by pressing the bearing into grease to force grease between the rollers.

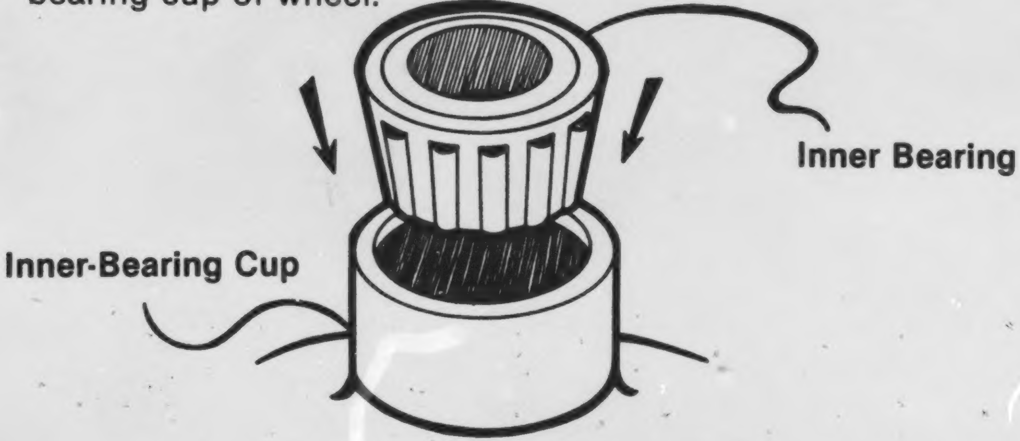
14. Clean inside of hub.



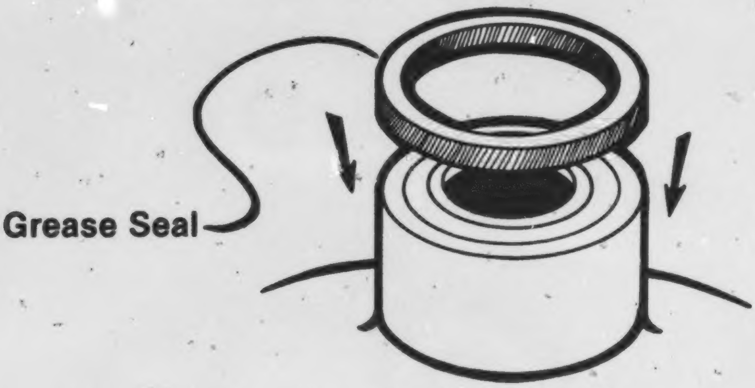
15. Apply fresh grease evenly inside hub and grease cup.



16. Insert inner bearing with narrow ends first into inner bearing cup of wheel.


Inner Bearing
Inner-Bearing Cup

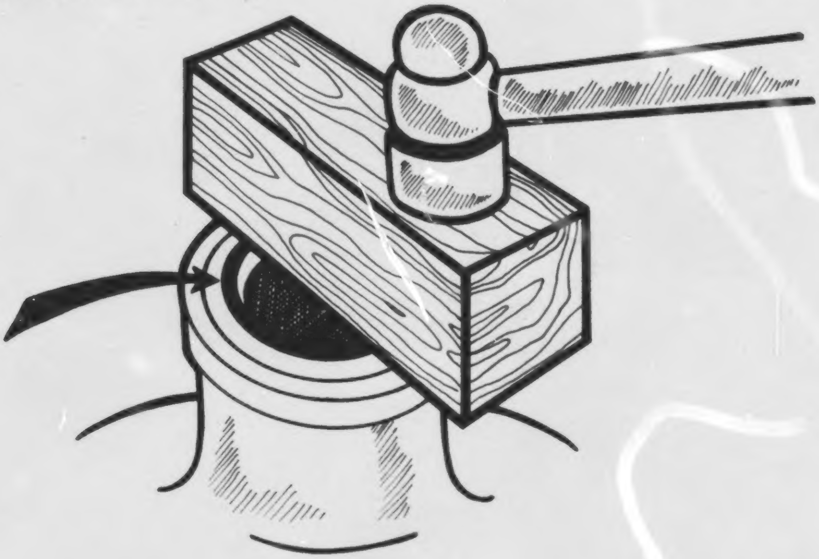
17. Apply a thin film of grease on sides of grease seal. Place grease seal over inner bearing.


Grease Seal

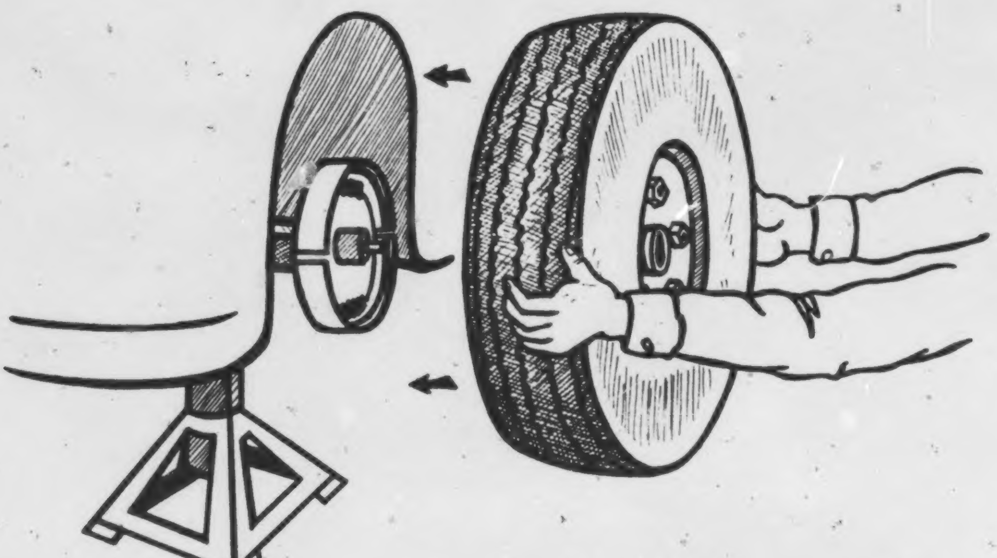
NOTE!

Always use a new grease seal.

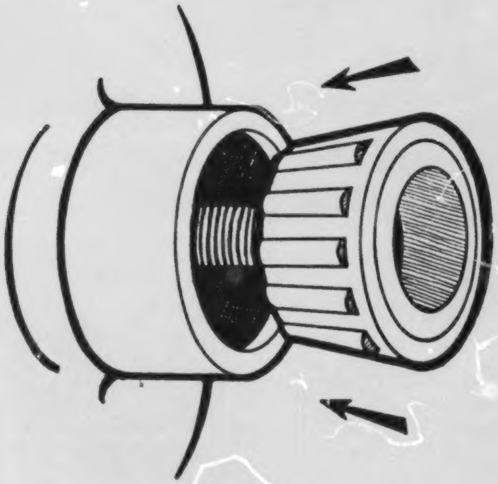
18. Place a block of wood over grease seal. Tap it gently until the seal levels with hub lip.



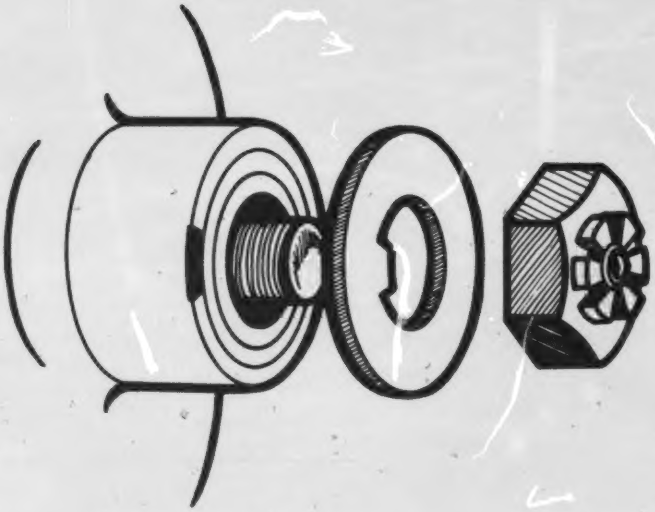
19. Remount tire and wheel assembly onto spindle.



20. Slip outer bearing with narrow end first onto the spindle.



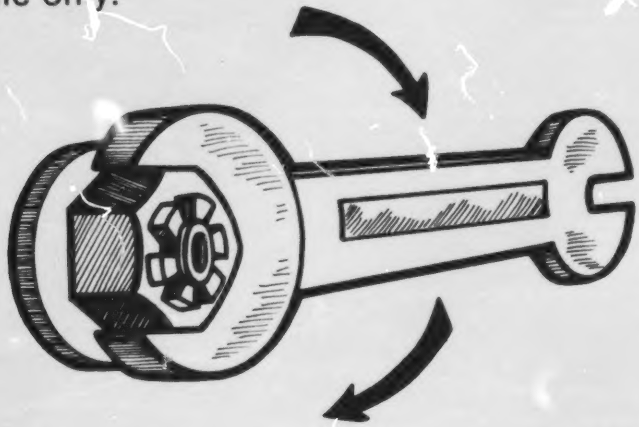
21. Put on the washer and bearing nut.



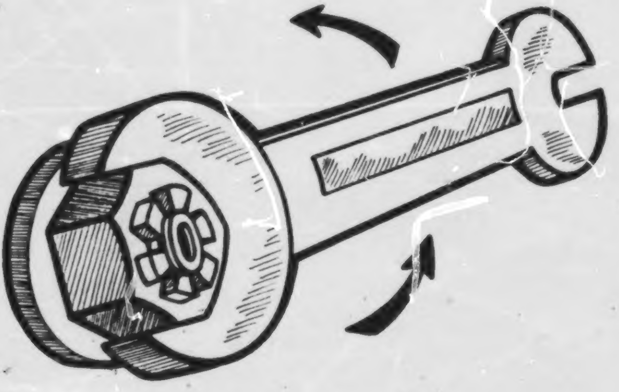
NOTE!

Look in the auto repair manual for correct way to tighten bearing nut.

22. Tighten bearing nut until the nut stops turning by weight of wrench handle only.

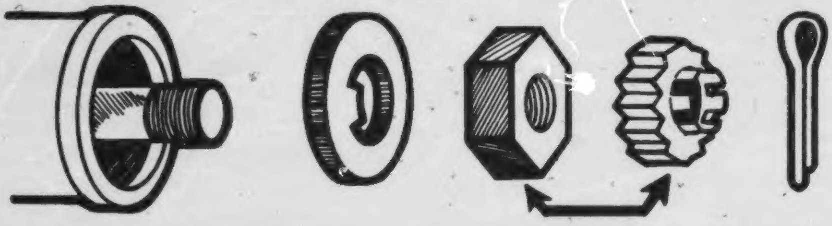


23. Turn the bearing nut back no more than one notch to replace the cotter pin.

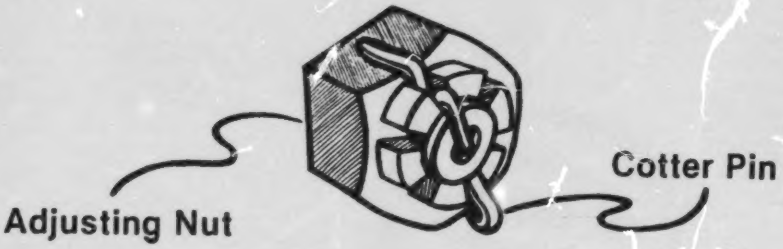


NOTE!

Some spindles have a special bearing nut with two parts.



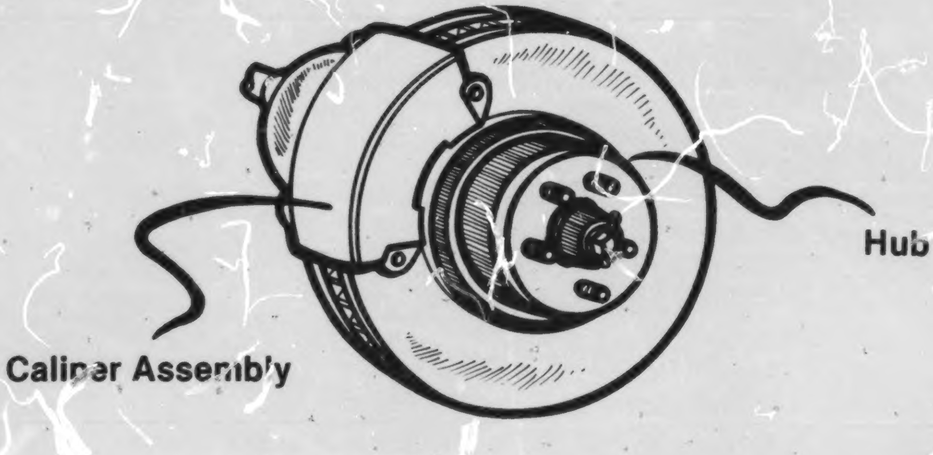
24. Insert the new cotter pin into hole to lock adjusting nut. Bend one arm of the cotter pin over the nut. Cut short the length of unbent arm.


Cotter Pin
Adjusting Nut

NOTE!

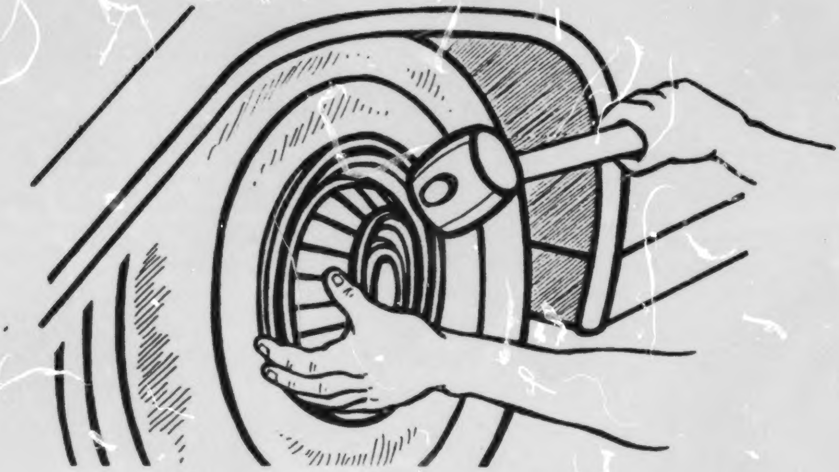
To pack wheel bearings on cars with disc brakes:

1. **Remove the wheel from hub.**
2. **Remove caliper assembly.**

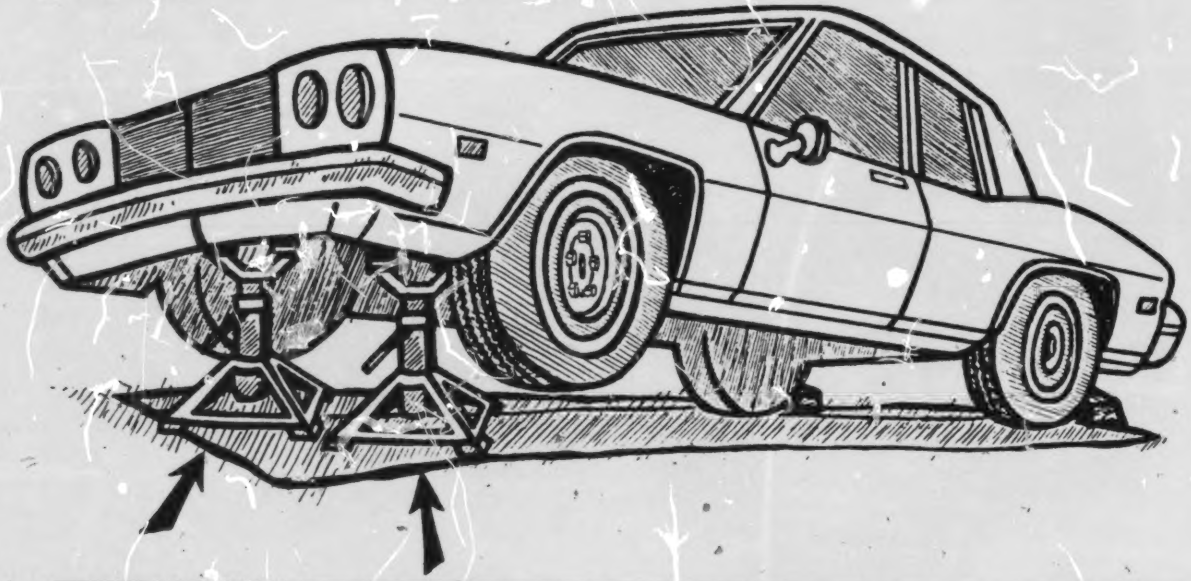

Hub
Caliper Assembly

Refer back to Step 5 and follow same procedure used on car with drum brakes.

25. Tap hub cap on securely with rubber mallet.



26. Remove jack stands and lower car. Remove wedge blocks.



NOTE!

Before Driving the car:

Pump the brake pedel three or four times to insure that the brakes are working properly.

27. Clean your work area and return tools to their proper places.

SEE YOUR INSTRUCTOR

Unit 21
Repacking Front Wheel Bearings

Tools and Materials Identification Exercise

Match the object with its correct name.

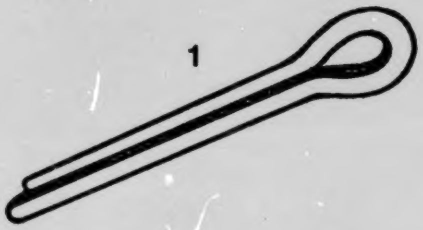
_____ A. Wheel Bearing Grease

_____ B. Cotter Pin

_____ C. Wheel Bearing Sets

_____ D. Punch

1



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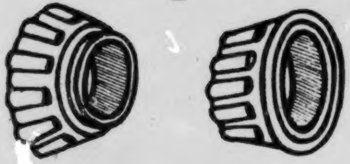

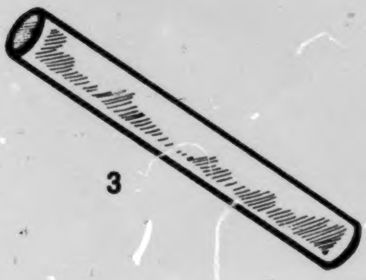

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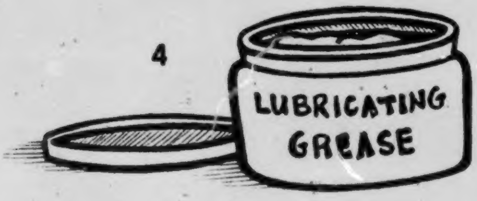

Unit 21
Repacking Front Wheel Bearings

Practical Exercise Performance Checklist

The student ______________________ successfully performed the following tasks:

Tasks	Yes	No	Comments
1. Identified:			
a. Wheel bearing grease			
b. Cotter pin			
c. Wheel bearing sets			
d. Punch			
2. Wore proper safety equipment.			
3. Raised front end of car and supported it on jack stands. Used wedge blocks on back tires.			
4. Removed wheel cover from wheel.			
5. Removed grease cap from center of the wheel.			
6. Straightened and removed cotter pin and adjusting nut.			
7. Pulled entire wheel and tire out about 1 inch, then pushed back in place.			
8. Removed outer bearing assembly and washer. Wiped clean with cloth.			
9. Carefully removed wheel and tire assembly.			
10. Checked spindle and cleaned brake assembly.			
11. Tapped inner bearing and grease retainer out of the wheel. Turned wheel over.			
12. Cleaned and inspected bearings for cracks and wear. Replaced if not good.			
13. Repacked wheel bearings with grease.			

Tasks	Yes	No	Comments
14. Cleaned inside of hub.			
15. Applied fresh grease evenly inside hub and grease cap.			
16. Inserted inner bearing into bearing cup of wheel.			
17. Applied thin film of grease on both sides of grease seal and placed grease seal over inner bearing.			
18. Placed a block of wood over grease seal and tapped until seal leveled with hub lip.			
19. Remounted tire and wheel assembly to spindle.			
20. Slipped outer bearing onto spindle.			
21. Put on washer and bearing nut.			
22. Tightened bearing nut until wheel stopped turning.			
23. Turned bearing nut back one cotter notch.			
24. Inserted new cotter pin into hole.			
25. Bent and cut one arm of cotter pin.			
26. Tapped hub cap on with rubber mallet.			
27. Removed jack stand and lowered car. Removed wedge blocks.			
28. Cleaned work area and returned tools to their proper places.			

Satisfactory Performance ☐
Repeat Exercise ☐
Should Move On ☐

Instructor's Signature Date